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ABSTRACT

This document presents conference materials and five conference papers on literacy and the hearing impaired. Preceding the papers, a section of general information provides an introduction, conference format information, and a commentary by Michael Rodda. Recommendations from the work groups and an executive summary are then presented. Recommendations focus on the following areas: additional responsibility for the Office of Special Education Programs (e.g., establish a clearinghouse on literacy and the hearing impaired), technology, research, professional development, material development, program development, and funding. Three of the papers, on the topic of psychological processes, have the following titles and authors: "Psychological Processes: Processes in Reading and Writing" (Robert Kretschmer); "Cognitive Processes and the Hearing Impaired Learner" (David Martin); and "Social Aspects of Literacy Acquisition and Use" (Karen Reed Wikelund). Two papers address literacy technology: "Adult Literacy, Computer Technology and the Hearing Impaired" (Eunice Askov) and "Literacy and the Hearing Impaired: Living, Moving, Dynamic Text" (Frank Withrow). Conference participants are listed. (DB)

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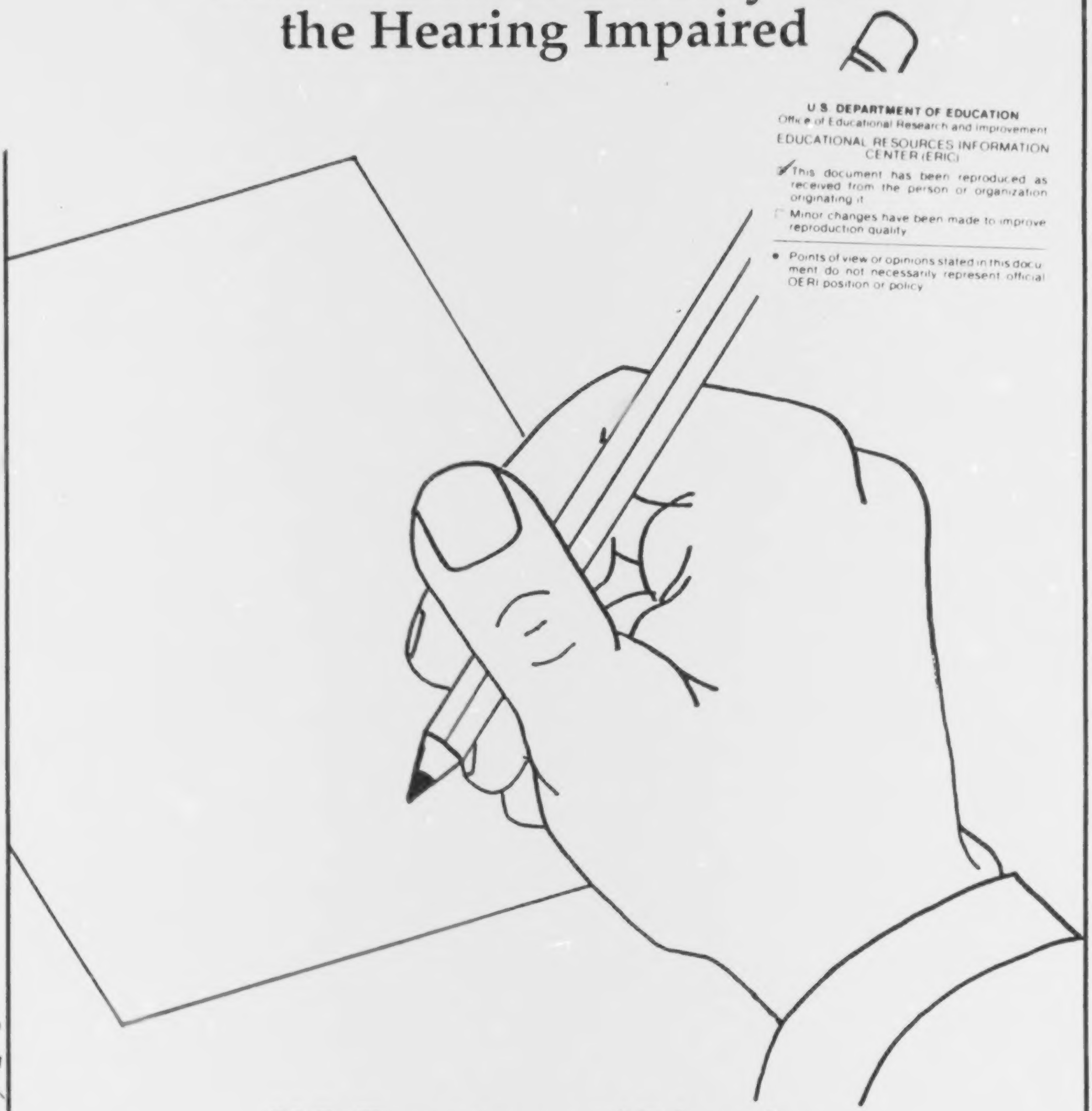
Conference on Literacy and the Hearing Impaired



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U.S. Department of Education
Division of Educational Services
Captioning and Adaptation Branch

May 18 - 20, 1989
Washington, DC

EC 301760

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The Conference On

LITERACY AND THE HEARING IMPAIRED

A Conference sponsored by the U.S. Department of Education,
Office of Special Education Programs, Division of Educational Services
Captioning and Adaptation Branch

Prepared By
Center for Systems and Program Development, Inc.
Janice M. Welborn, Project Coordinator
1612 K Street, NW #1100
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U.S. Department of Education

Literacy and the Hearing Impaired

What We Need to Know About Learner Competencies of Hearing Impaired Adolescents and Young Adults

(A conference sponsored by the U.S. Department of Education,
Office of Special Education Programs,
Division of Educational Services, Captioning and Adaptation Branch)

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General Information

PREFACE

Ernest E. Hairston, Chief

Captioning and Adaptation Branch

The intent of this Conference on Literacy among Persons who are Hearing Impaired was to convene a group of persons knowledgeable in the areas of literacy, deafness, media technology, and special education, including adult education who would pool resources and formulate recommendations on how literacy among persons with hearing impairments could be enhanced or, at the least, addressed. The major focus of the Conference was to examine current research in the area of literacy and develop recommendations for future directives in research and interventions for consideration by the U.S. Department of Education's Office of Special Education and Rehabilitative Services (OSERS).

This conference was a result of one of several recommendations from the National Conference on New Directions for Captioning, sponsored by the U.S. Department of Education, Office of Special Education Programs' Division of Educational Services and held November 12-14, 1986.

Literacy is a growing concern among educators in general and in special education. With the widespread availability of current and advancing technologies such as telecommunication devices for the deaf (TDDs), captioned films/videos, and closed-captioned television, theories have been advanced that the literacy level among persons who are deaf or hard of hearing is improving. There are indications that suggest that secondary users benefit from these captioning efforts as well. For example, we know that a large number of Line 21 close-captioned decoders are bought by persons with normal hearing, who speak English as a second language, for the purpose of enhancing their literacy skills. Teachers in mainstreamed programs have written to say that captioned films they ordered for the students in their classes who are hearing impaired have also boosted the education of regular students in their classes. However, there is very little unbiased data that address literacy-related issues as they relate primarily to persons who are deaf or hard of hearing.

Participants in this conference addressed these issues and recommended research initiatives, both short term and long term, which address a wide range of concerns. The ultimate outcome of these recommendations is increased literacy among persons who are deaf and hard of hearing.

This report of the conference includes copies of prepared presentations as well as a summary of major themes and a series of recommendations.

I am pleased to have been a part of the initiation of this important milestone and appreciate the efforts and contributions of conference participants. Lastly, but not least I commend Janice Welborn, Project Coordinator for the Center for Systems and Program Development, Inc. for orchestrating this effort.

INTRODUCTION

Janice M.Welborn
Project Coordinator

The Conference on Literacy and the Hearing Impaired was born out of a recommendation made in November 1986. At the National Conference on New Directions for Captions, sponsored by U.S. Department of Education, Office of Special Education Programs' Division of Educational Services. The Division was given the following mandate:

> **"...bring together a group of experts from its own and other units of the Department of Education, and from the world of leading researchers in reading and language acquisition, as well as those from other Federal agencies, such as the Department of Defense, concerned with adult literacy and develop an agenda for long-term, jointly-supported studies on effects of captioning....This recommendation should be given the highest possible priority."**

It was determined that this recommendation could best be addressed in a conference setting. The Division moved forward in the fulfillment of the mandate by procuring services for an assembly of key individuals to address illiteracy among persons with disabilities, with particular attention to the high rate of illiteracy among hearing impaired adults.

The Conference on Literacy and the Hearing Impaired, held May 18-20, 1989, at the Capitol Holiday Inn, Washington, D.C., brought together researchers, educators, Department of Education personnel, and service providers. Its goal was to provide an opportunity for information-sharing and to recommend strategies and sound approaches to impact the high rate of illiteracy among hearing-impaired individuals. A seven-person Planning Committee, consisting of experts in the fields of education of the hearing-impaired, educational media, captioning technology, research, and literacy developed the focus of the Conference around that purpose. Planning Committee members also shared their expertise by serving as group participants, group facilitators and presenters.

The commentary, papers, and recommendations which follow center on three critical and important points:

1. The growing need in the area of adult literacy in general and the hearing impaired community in particular;
2. A definition of the parameters of issues facing the hearing-impaired community and service providers; and
3. Practical and feasible recommendations for the enhancement of literacy among adolescents and young adults who are hearing-impaired.

As a result of the recommendations made at the Conference on Literacy and the Hearing Impaired, guidelines have been established which will facilitate the Department in completing its mandate -- the implementation of recommendations to increase literacy among people who are hearing impaired.

FORMAT OF PROCEEDINGS

by

Leonard P. Kelly, Ph. D.

Rationale for the Conference

Reading and writing pose serious problems for hearing impaired students, many of whom find that the information and enjoyment of books are not easily retrieved. Allen (1986) reported the reading performance of the average hearing impaired seventeen-year-old is comparable to a hearing child who is more than seven years younger. Although it is unlikely that these statistics reflect the actual internal competence of hearing impaired readers, the data are a source of concern.

As stated in Toward Equality : A Report to the President and the Congress of the United States [by] The Commission on Education of the Deaf (February 1988):

> **"The Educational system has not been successful in assisting the majority of students who are deaf to achieve reading skills commensurate with those of their peers....The Congress and the Department of Education should ensure that facilitating English language acquisition in students who are deaf...is a paramount concern guiding the implementation of exemplary practices."**

The difficulties encountered by the hearing impaired in the area of writing have also been documented in a number of studies. These problems range from stilted and simplistic stylistic choices, to lack of elaboration and organizational structure, to glaring grammatical errors that sometimes appear even in the writing of those hearing impaired people with advanced academic degrees (Kelly, 1988).

Most teachers of the hearing impaired express deep concern about the literacy of their students -- but the evidence does not warrant total pessimism or fatalism. Deafness does not guarantee illiteracy, and there are numbers of people with profound hearing losses who do read and write with considerable proficiency. For example, at Gallaudet's Model Secondary School for the Deaf during the 1987-88 school year, the average performance of the 41 students in the Advanced English Program was comparable to the average hearing student who was nearing high school graduation. Despite a better-ear average hearing loss of 96.2 decibels for students in the program and their virtual isolation from the sound of spoken English, the students managed to become adept at processing English text. (Center for Curriculum Development, 1988).

The success of these students encourages a good measure of optimism for helping the hearing impaired population, the majority of which has limited literacy skills. This evidence also mandates (in the Statement of Work) a vigorous effort to deal with the problem:

"...to conduct research that supplies a more complete understanding of psychological and social processes -- both cognitive and effective -- that promote competent performance and the acquisition of competence, to identify and develop instructional materials and methods that are in harmony with those psychological and social processes, and to apply visual and computer technology to the extent that they make a unique contribution to the development of literacy.

CAB accepted this mandate and sponsored the Conference on Literacy and the Hearing Impaired to provide an opportunity for information-sharing, brainstorming initiatives, and determining strategies and sound approaches.

Encouragement of Diverse Views

The Conference was planned by a group of educators and researchers from the field of deafness who themselves had diverse perspectives on literacy. This group identified important dimensions of literacy acquisition and performance to be specifically addressed in the Conference. Some of those dimensions imply choices between competing schools of thought.

Research Methodology

The Planning Committee agreed that it would be useful to promote discussion of both experimental/quantitative research and ethnographic/qualitative investigations.

Cognition and Deafness

The Conference needed to consider whether the hearing impaired have unique or conventional cognitive capacities.

Instructional Methodology

There were various instructional approaches that warranted attention: communicative/whole language approaches vs. explicit, skill-centered approaches; use of conventional printed text vs. technologically sophisticated media, such as computers and video disc.

Attention to Both Reading and Writing

Planners felt that the Conference should address both reading and writing. Performance by hearing impaired people tends to be limited in both processes. Research findings in one process may illuminate understanding of the other. There is evidence that combining the two processes for instruction may be more effective than treating them individually.

Influences on Performance

Cognitive/psychological factors were considered important to include, as were affective/social factors.

Target Populations

Planners considered it important to keep sight of important sub-groups among learners, rather than obscure important distinctions by blending all into one amorphous mass. Examples are adults vs. children; profoundly deaf vs. those with less severe hearing losses; and learners of deaf parentage vs. those with hearing parents.

Aspects of Texts and Knowledge of Texts

It was deemed important for the Conference to address the fact that both reading and writing may require the processing of multiple aspects or features of text. These can include orthography, phonology, syntax, semantics, pragmatics, and discourse structure during reading. While composing, writers may have to manage such textual features as handwriting, spelling, punctuation, syntax, word choice, transitions, purpose, organization, clarity, rhythm, and audience characteristics. More than existing solely on the printed page, these features reside in the minds of literate people, awaiting retrieval and application during acts of literacy.

Conference Format

The conference format was designed to promote full discussion of the above topics. Lectures by five educators were alternated with smaller working sessions to discuss the implications of the lectures for literacy and deafness; generate recommendations for practice and research related to literacy; and then debate the relative importance of the collective recommendations. There were three major format components:

Invited Working Groups

The working groups included researchers, trainers of teachers of the hearing impaired, administrators of schools and programs for the deaf, curriculum specialists, teachers of the deaf, government officials, and librarians. The diversity of the participants contributed to the richness of the discussions.

Invited Presentations

The choice of topics for the five invited presentations was dictated by the objective of touching on the multiple dimensions of literacy as it relates to deafness. The speakers put forth positions that were not necessarily incompatible with each other, but they each made a unique contribution. Thus, in their working groups, Conference participants were obliged to incorporate five sets of considerations into their discussions leading to concrete recommendations.

Recommendations

The presentations stimulated discussions in working sessions leading to concrete recommendations for programs of instruction and research. The recommendations will provide the Captioning and Adaptation Branch access to the substance from which to have a literacy component that will make a significant contribution to improving reading and writing among the hearing impaired.

Literate people apply many kinds of knowledge when they read and write; therefore, it is fitting that the Conference on literacy and the hearing impaired would encourage simultaneous consideration of many views of literacy theory, research, and instruction. Veterans in this field know well that there is no scarcity of divergent points of view. It is as a result of the format, the invited speakers, and the working group participants that this Conference made a concerted effort to attract and benefit from that diversity. The sharing of thought and the dialogue that characterized the Conference is a model of the kind of exchange that benefits the field of hearing impairment. Communication within any field is more productive when its members aspire to creative dialogues, rather than pairs of simultaneous monologues.

The succeeding pages attest to the value of the Conference and its implications for the future. By encouraging diverse views, CAB created an atmosphere in which realistically defined parameters could be identified and consensus could lead to workable recommendations.

References

Allen, T. (1986). Patterns of Academic Achievement Among Hearing Impaired Students: 1974 and 1983. In A. Schildroth and M. Karchmer (Eds.), Deaf Children in America (p.161-206). Boston: Little, Brown and Company.

Kelly, L. (1988). Relative Automaticity Without Mastery: The Grammatical Decision Making of Deaf Students. Written Communication, 5(3), 325-351.

ACKNOWLEDGMENTS

The Conference on Literacy and the Hearing Impaired was made possible through the sponsorship of the U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs. It is through the assistance, dedication, and direction provided by experts from both the public and private sectors that the Conference produced viable results.

Special recognition must go to the members of the Planning Committee who volunteered to accept the responsibility and challenge of establishing the format and content:

Dr. Roberta Truax
Chairperson of the Planning Committee
University of Cincinnati

Mr. Ernest Hairston
U.S. Department of Education

Dr. Leonard P. Kelly
Gallaudet University

Dr. Vicky Hansen
IBM Corporation

Dr. Kathleen Crandall
National Technical Institute
for the Deaf

Dr. Teresa Rosegrant
George Washington University

Dr. Janice Berchin
Columbia University

Professor Michael Rodda
University of Alberta, Canada

Special appreciation is also expressed to Dr. Joseph Rosenstein of the Office of Special Education Programs who initiated the planning phase of the Conference.

It is because of the efforts of group facilitators that the diversity represented at the Conference was blended into common goals which resulted in significant recommendations. Therefore, we acknowledge the service of the group facilitators:

Ms. Terri Forman
Researcher and Consultant

Dr. Jamie MacDougall
McGill University

Dr. Barbara Kannapel
Deaf Culture Consultant and Teacher

The work produced by the facilitators and the working groups will provide the necessary impetus for OSERS program designers as they undertake new initiatives on literacy.

Special appreciation is extended to the Center for Systems and Program Development. Working in close cooperation with the OSERS Division of Educational Services, the Center provided the organizational and logistical support essential to the initiation and successful fulfillment of the department mandate.

CONFERENCE ON LITERACY AND THE HEARING IMPAIRED

CONFERENCE COMMENTARY

Michael Rodda

University of Alberta

First, let me acknowledge the generosity of our American colleagues in involving so many Canadians in this Conference. It augers well for "Free Trade" and closer ties between our two countries. Second, allow me to pay tribute to the speakers and staff involved in planning the Conference. They have enabled us to participate in a stimulating and productive dialogue.

In this summary, I will draw out some concepts explored in the Conference and highlight some of the key recommendations which evolved. We chose to focus on a number of intriguing questions in our discussions:

1. Is literacy the same for hearing impaired and hearing people?
2. Are there appropriate assessment systems for identifying strength in literacy skills?
3. Is there a cultural bias (anti-deaf culture) in present research? If so, can this bias be changed or modified?
4. Do we need more ethnographic research which asks students what they are doing when they read or write?
5. Is literacy limited to English or should it include other languages, specifically sign language and/or other oral languages?
6. Should all televisions include a chip that decodes captions?

7. Should there be more than one kind of captioning (e.g. self captioning and educational captioning), and should captioning be extended to other forms (e.g., movies, TDD's)?

8. Should teachers be trained and re-trained in the use of technological aids?

9. Do and should captions increase accessibility to information?

10. Should captions develop specialized tools for information transmission?

11. Will captions impact on literacy and is this important question presented for working group consideration?

12. Is "print on screen" helpful to students developing literacy?

13. Should all Federally-funded projects include a component for the training of personnel?

The Conference on Literacy and the Hearing Impaired has not answered all the above questions, but it has made a significant start. The recommendations which resulted are, in many ways, determined by the depth of the investigation into these key areas of concern.

CONTENT OF PREPARED PAPERS

Concrete vs. Abstract Dimension

Dr. Martin refers to this dimension and Myklebust's role in establishing what was inaccurately regarded as the quantitative equality, albeit qualitative inferiority, of hearing impaired students. He also discussed the importance of symbol discovery, as opposed to the use of symbols. The issue returns again when Martin explores Moore's contention, with which I agree, that there is little evidence to support the suggestion that hearing impaired students are concrete thinkers. Indeed, developmental psychologists question if there is a real distinction between abstract and concrete, rather than developmental phases or learning strategies that foster the use of one or other types of experience.

A study by Hoemann and Andrews (1975) is a good example of the kind of research that questions this distinction. It compared the sorting patterns of hearing impaired and hearing subjects for concrete (high imagery) and abstract (low imagery) words, and is discussed in Rodda and Grove (1987). The two lists were very carefully controlled with respect to frequency, sign ability, and normative vocabulary measures. In addition, the common nouns employed in the first of two experiments were included to assess reliability. For the high imagery words, both hearing impaired and hearing groups achieved overlap scores of 0.500. For low imagery words, the overlap scores were about the same (0.611 for deaf subjects, 0.666 for hearing). In the high imagery examples, deaf subjects tended to classify magazine with avenue; hearing subjects tended to classify it with chair. The deaf subjects grouped the low imagery word length with style, where hearing subjects linked it with hour. The authors concluded that "the present studies provide strong evidence for equality of hierarchical semantic structure in deaf and hearing subjects" (Tweney, Hoemann, and Andrews, 1975, p.72). Rather than being concrete thoughts, the responses of hearing impaired students to abstract verbal materials is very similar to that of hearing students when no demands are made in syntactical skills. In the view of the limited verbal experience of hearing impaired children, research findings pose interesting questions concerning the acquisition of semantic formation, these questions were addressed in some detail throughout the Conference, and with a more practical approach than is characteristic of some conferences.

Cognitive Strategies

The question is sometimes raised: "Do spoken languages use temporal mechanisms?" The answer is "No -- this is another over simplistic notion which has tended to cloud our thinking on these matters." A much more important focus is recorded by David Martin and Robert Kretschmer -- the focus of cognitive processing strategies or cognitive enrichment. Literacy must be preceded by developments in this area. Martin points out that Feuerstein and Kutz (1984) found the Learning Potential Assessment Device (LPAD) to be a useful tool in delineating the cognitive deficiencies, strengths, and potential of hearing impaired students. Feuerstein's learning approaches are valuable in both facilitating our understanding and providing practical methods of helping hearing impaired students (Kutz, 1983). Keane found that LPAD mediated transfer of learning by providing feedback to the students. It emphasizes the cognitive competencies of hearing impaired students.

Martin (1984) has also evaluated the use of Instrumental Enrichment (IE) intervention. He looked at secondary age adolescent hearing impaired students in a Total Communication environment, and reported that the experimental group showed consistent improvement in systematic approaches to problem solving, completeness and organization in problem solving, reading comprehension, mathematical achievement, ability to generate several problem-solving strategies, and ability to logically defend their strategies (Ojile, 1988).

Such research clearly indicates the potential of hearing impaired students far exceeds what we have previously assumed, and shifts us from a deficit to an abilities model of deafness -- a shift that is vital if new technology is to be used for the benefit of hearing impaired students/adults.

Socio-Cultural Factors

The concept of intergenerational transmission is important and, indeed, it is often forgotten that the important social variables for hearing people are at least of equal significance to degree of hearing loss and age onset of deafness. Askov, Kisner, and Van Horn make this point (page 2) -- "less educated homes offer fewer opportunities for the preschool child to observe role models performing reading." We can relate this to the concept of "thinking" as a fourth basic skill (page 3) and the cognitive enrichment strategies discussed by Martin.

Such agreements lead us to the "whole language" approach (although for educators of the hearing impaired there needs to be some care in the definition of this (page 4) and the process approach to writing). In this context, Wikelund identified the concept of literacy:

1. Cultural Practice
2. Collaborative Social Activity

As she rightly pointed out, both concepts are foreign to schools and classrooms -- but was that always so? Equally, they are foreign to the concepts of the bureaucracy, since we have recently proclaimed a "Multi-Culturism Act" in Canada that excludes both hearing impaired culture and literacy (not languages) from its mandate. She states that "literacy is not limited to formal, structural tenants, but rather is often closely linked to spoken language." But deaf and hearing impaired students are denied both spoken and/or sign language -- not by their disability, but by the communicative competence of their parents and teachers (their environment). Perhaps Heath's work has major applications to the education of hearing impaired students.

As a result of the above considerations, reading researchers are coming to the view that "reading skill" is not a consistent ability, but one that can vary with each text. We are all good readers of some texts and bad readers of others, and our performances will depend less on our "reading skills" than our miscellaneous information. (Hirsh, N.Y. Times, Ed. survey, Nov. 11, 1984).

Metacognition

I found agreement with David Martin's emphasis on metacognition in that it relates to some research by Annie Tsui and myself. Martin states:

"Delays involving visual attention and perception do not

> appear to be serious, but when visual perception leads to incorrect inferences, some significant delays are seen. A large body of data indicates that deaf learners rely heavily on visual-spatial perception and processing, and have strength in simultaneous visual processing which is holistic. As indicated above in the section on organic or neuroanatomical aspect of cognition, weaknesses among deaf learners are found in verbal-sequential and abstract processing"
>
> "Every school subject area has certain cognitive prerequisites which are essential for progress within those subjects. A clear example would be the area of reading comprehension. Various researchers in the field of reading have used what is known as schema theory (Rumbelhart, 1980) to develop better understanding of the reading process. The theory incorporates the use of schemata, the process of spontaneous comparison, and categorization -- all important to the reading process; this approach views reading comprehension as the process of correctly accessing a cross-indexed conceptual filing system."

In an extensive study of these aspects of cognition, Tsui (1988) concluded:

1. Development seems to be relatively independent of capacity.
2. Successful students were able to self question and monitor; less successful students needed to develop executive-type skills.
3. Encoding spatial and temporal information seemed to be a conceptual/strategic as well as a perceptual process.

4. Social experiential deprivation limits the range of functioning.

5. Mediated learning experience needs to be provided from an early age. (Vygotsky, Feverstein, and Ausebel).

6. Externally guided thinking should also be used for teaching reading (e.g., Erickson), involving metacognition, mediated learning, and semantics.

7. Bimodal (sign and oral), interlingual format with turn-taking and metacognitive monitoring, needs additional development.

These conclusions were reflections of the nature of the discussion and the dialogue at this Conference. In summary, this reflects the need for major changes in our approaches to teaching hearing impaired students.

Perhaps without realizing it and perhaps without expanding it, Askov, Kisner, and Van Horn introduce the sociological concept of oppression or "empowerment". Schlesinger has explored the concept extensively in the field of deafness. It offers a bicultural/ bilingual model that downplays the deficit aspect of deafness. For example, in its core course list, Boston University provides only one audiology course, while five American Sign Language courses are required of the students.

Shelley Carver (1987), in a nationwide study of training and educational opportunities for hearing impaired students sponsored by Employment and Immigration in Canada, concurs:

> **"Teacher training programs tend not to instill in their students the need to develop appropriate attitudes toward the hearing impaired children, such as having higher expectations"**

An extreme example of a deficit-model teacher training program is described and advocated by Ling, Ling, and Pflaster (1977). It places a heavy emphasis on the training of "teacher/therapists" and the "treatment" of deficits in the hearing and speech function in hearing impaired children. Johnson, Liddell, and Erting (1989) comment:

> **"In most such programs, it is rare to have a course about deaf people interacting with each other, a course that teaches about the role of ASL in the ordinary development of deaf children, or even a course that teaches a future teacher to understand or produce ASL. In fact, virtually all such programs teach only some system for SSS (sign-supported speech), and usually require only two or three such classes. The result is that although trainees meet the expectations of the program, they are nevertheless singularly unprepared to teach deaf children (page 12)."**

In this light, a shift of focus from a special education orientation to that of minority education with a socio-cultural focus is a vital need for teacher training -- again a need reflected in the dialogue and discussion which took place at this Conference.

RECOMMENDATIONS

The following is a synopsis and summary of recommendations. They are based on Robert Kretschmer's four basic concepts, and take into consideration a fifth (networking and dissemination) and a sixth concept (technical and methodological).

1. Process not Product

    a. Apply knowledge of literacy in other populations to hearing impaired students and adults.
    b. Allow hearing impaired students and adult learners access to all modes of communication provided by competently trained professionals.
    c. Better define the variety of learning styles and strategies used by hearing impaired individuals.
    d. Use TDDs to study literacy in deaf and hard of hearing users (e.g., analyzing writing patterns over a period of time.)

2. Providing Knowledge Background

    a. Evaluate and fund development projects using instrumental enrichment and other similar strategies.
    b. Study how such strategies can transfer "cognitive" skills and abilities to literacy.

3. Teaching Strategies/Textual Form

    a. Develop a more appropriate model for teacher training and upgrading.
    b. Study conversational processes in English and the textual information base used in teaching.
    c. Develop "Self Captioning" as a technical process and a teaching technique.
    d. Develop research into the use of TDDs as a discourse process.
    e. Ensure real time captioners have a stronger knowledge base in the subject area.

4. Using a Functional Systemic Approach

    a. Maintain expectations of literacy.
    b. Involve more deaf and hearing impaired people in research.
    c. Identify the specific factors that contribute to achieving literacy.
    d. Research how literacy skills are acquired, both in school and out of school (home), and relate this to ethnic background and age.

5. Networking and Information Dissemination

    a. Evaluate the content of research journals and make them more responsive to changing needs.

b. Improve dissemination of demographic information about the ability of different populations to benefit from captioning, and research these populations (e.g., ESL, adults, beginning readers).
c. Undertake public awareness campaign about the benefits of captioning.

6. Technical and Methodological

a. Establish what populations are served and are not being served by technology.
b. Evaluate the use of captioning as an integral part of and not just an "add on" to the instructional process.
c. Undertake ethnographic research into successful and unsuccessful hearing impaired readers.
d. Develop better measures of literacy for the assessment of individual learners.
e. Extend studies of hearing impaired children of hearing impaired parents to include studies of literacy.
f. Study the integration of ASL and English in the classroom, and explore the language acquisition process.
g. Focus experimental studies on the effects of various types of captioning (speed, size of print, etc.) on hearing impaired learners with various characteristics (hearing loss, first language, language level, socio-economic status and educational variables).
h. Encourage research into new interaction technology in captioning (e.g., CD-ROM, video disc).
i. Establish a dual-party relay service (using the phone companies) to increase the use of TDDs and improve literacy.
j. Study the effectiveness of assistant listening devices in enhancing literacy.
k. Various research initiatives should be conducted by academic personnel and/or institutions, thereby avoiding conflict of interest.
l. Convert TDDs to ASCII codes, thereby creating better access to TDD/Computer Networking system.

Work Group Recommendations and Executive Summary

WORK GROUP RECOMMENDATIONS

Conference of Literacy and the Hearing Impaired

May 18-20, 1989

I. The Department of Education, specifically the Office of Special Education and Rehabilitative Services should assume direct responsibility for:

  A. Establishing a clearinghouse(s) for information and research (past, present, and future) on literacy for the hearing impaired and technology (including captioning). (This clearinghouse(s) should (1) have a physical location(s) and office(s) that can be contacted or visited, as well as have resource information on a database; (2) compile, organize, and consolidate existing research on literacy and captioning to pay particular attention to the characteristics of both children and adults who have effective receptive and expressive communications skills and its carry-over into communicative practice);

  B. Increasing public awareness about the benefits of captioning in improving literacy learning;

  C. Establishing a nationwide dual-party relay service using telephone companies across the country, if it can be determined that use of TDDs contributes to the increase of literacy among users;

  D. Identifying the characteristics of effective literacy programs for the hearing impaired and the deaf; and

II. In the area of technology, we recommend that:

  A. Research be conducted to determine the range of instructional uses of captioned television in literacy development (with different populations such as hearing impaired individuals, ESL, adult beginning readers, and learning disabled populations);

  B. Studies be conducted to determine the benefits of captioning in teaching reading in both classroom and out-of-classroom situations;

  C. Studies be done on the readability and adaptability of documentation accompanying technological software and hardware used in literacy programs, i.e., that these materials be easy to understand;

D. Measurement tools be developed to determine the effectiveness of assistive listening devices with respect to the enhancement of literacy;

E. Research be conducted into developing special technologies to implement literacy programs such as interactive, tailorable user-generated captioning, whereby the user can generate or manipulate captions (examples are interactive computer programs, interactive video discs, CD-ROM, DVI, and CD-1);

F. TDDs be investigated as a literacy tool and as a source of research data (for example, analyzing writing papers of a group of hearing impaired users over a period of years);

G. There be research into issues relating specifically to the captioning process, including the speed of captions, the syntactic structure, verbatim/edited, caption placement, concept density, size, color, font, synchronization of captions with speakers, and the use of "dynamic" captioning techniques. (This research should be conducted with a range of people of various backgrounds and ages, using various types of communication modes: hearing loss, first language, language level, socioeconomic variables, and additional disability conditions.)

III. Regarding cognitive processes for reading and writing among hearing impaired people, we recommend that research be conducted in the following areas:

A. Language Acquisition -- What is the relationship between language acquisition and the various forms of communication in the hearing impaired?

B. Cognitive Make-Up -- How do we approach cognitive prerequisites and transfer those prerequisites to literacy?

C. Conversation in English vs. Textual Information -- How can we base teaching strategies on students' language base for reading?

D. Measures of Literacy -- Assessment of how an individual learns; matching of methods and materials.

IV. The following are examples of research questions related to the social components of literacy. We highly recommend the use of ethnographic methods for investigating these questions, the training of teachers as researchers, and the involvement of the hearing impaired community in the research process.

A. How are literacy behaviors and skills acquired both in the school context as well as out of school with respect to different hearing status, ethnic and cultural backgrounds, and ages?

1. What is the world of the individual?
2. What do they need to know regarding problem solving strategies vs. content?
3. Are hearing impaired learners in a "different" world?
4. Do we need to investigate the world of the hearing impaired and literacy-help strategies for individual hearing impaired learners?

B. What are the characteristics of successful hearing impaired readers?

C. What is the role of technology in raising self-esteem among undereducated hearing impaired learners to the extent that they are motivated to develop and improve literacy levels?

V. Professional Development -- in the area of professional development, we recommend that:

A. There be financial incentives for educators to specialize in literacy training for adolescents and young adults;

B. Cross networking between adult education professionals and hearing impaired educators be encouraged, enabling professionals to learn from each other and work together on areas of mutual concern and interest;

C. Teachers be provided with ongoing educational and technical training and support as literacy programs and technologies are developed and implemented;

D. State guidelines and standards be established for the training of teachers of undereducated adults, with attention to special groups, such as hearing impaired individuals, ESL students, etc.;

E. Research and techniques that have been developed regarding collaborative learning be applied to literacy programs for hearing impaired individuals; and

F. Strong efforts be encouraged to recruit hearing impaired adults to teach literacy to hearing impaired adults.

VI. Material Development -- the following general comments were made on material development:

A. Materials used in literacy programs (such as books, videos, computer software programs) must reflect our pluralistic society, being free of stereotyping with regard to race, sex, age, physical ability, ethnicity, or class.

B. Integration between ASL and English needs to occur in the classroom. Technology may be a viable way to bring ASL into the classroom.

C. Develop more materials and explore the use of cable stations for delivery of those materials.

VII. Program Development -- we recommend that:

A. The various research initiatives be conducted by academic personnel and or institutions with an objective view to avoid conflict of interest;

B. Active involvement of hearing impaired persons on research teams including technological development projects along with practitioners, teachers, and other professionals in deafness be encouraged;

C. The question, "What are the factors that lead to literacy learning, including technology factors, interpreting, captioning, etc.", be answered; and

D. A community-based adult literacy demonstration project be developed for hearing impaired individuals incorporating visual technologies (TDD, captioning, interactive video discs, computer networks).

VIII. Funding -- in the area of funding we recommend that:

A. Funded research include as an essential aspect the means or mechanisms for implementation (translating research into practice); and

B. Special funds be set aside for projects that involve best-practice approaches and state-of-the-art equipment and software.

CONFERENCE ON LITERACY AND THE HEARING IMPAIRED

May 18-20, 1989

Washington, D.C.

The Center for Systems and Program Development, Inc.

Washington, D.C.

EXECUTIVE SUMMARY

Overview

It has become increasingly evident that American society is rapidly evolving to a point where the attainment of a full and successful life will depend more heavily than ever on the mastery of skills necessary for competence in a burgeoning age of new technology. Although the hearing impaired are the direct beneficiaries of some of the technological growth, research indicates that, as a group, they are generally less prepared to meet the challenges posed as a result of this evolution.

In testimony before the U.S. House of Representatives Subcommittee on Select Education, Frank Bowe, Chairman of the Commission on Education of the Deaf, stated:

> **"The Commission was not satisfied with the quality of education for children who are deaf. It is a well known fact that in deafness, the earlier you intervene and teach language, the more successful the child will be....We believe that people with disabilities in this country have a right to expect quality in**

education... A number of school superintendents and parents and teachers told us that they believe that their children were being harmed."

Many advocates for the hearing impaired charge that the harm which is being done to students with hearing disabilities results from neglect, albeit benign neglect. The words of Dr. Henry Klopping, Vice Chairperson of the Commission on Education of the Deaf, echoed that sentiment clearly in his testimony before the House Subcommittee:

> **"The issues and concerns regarding infant through high school education of deaf children received more attention from parents, deaf consumers, professionals, and interested persons than any other issue faced by this Commission. The first issue is that of appropriate education. Despite the Education of the Handicapped Act, we heard from hundreds of parents and educators who told us that many children who are deaf do not receive special education and related services appropriate to their unique needs. The incidence of deafness coupled with its unique ramifications means that the needs of these children are easily and frequently neglected."**

The same technological age which presents tremendous potential problems for the disabled also holds many of the solutions. Literacy among hearing impaired students can lag behind literacy in the hearing population by as much as seven years, according to some researchers. Among the most effective tools to emerge from technology and to impact literacy among the hearing impaired is television captioning. Its value in language acquisition and the attainment of reading skills may only be limited by its availability and the amount and type of material captioned. The ability of the educator to exploit the flexibility of captioning and tailor learning programs to meet the specific needs of hearing impaired students may provide a partial solution being sought by Dr. Klopping and others:

> **"The common sense solution for remedying past negligence requires, logically enough, that persons responsible for designing individualized education programs take into consideration factors such as the deaf child's severity of hearing loss; potential to use residual hearing; academic level and learning style; communicative needs and preferred mode of communication; linguistic, cultural social, and emotional needs; placement preference; individual motivation; and family support."**

Captioning, therefore, appears to possess the vast potential, in the words of Commission Chairman Bowe, "...for eradicating illiteracy in the country, and should be used that way."

Impact of Conference on Literacy and the Hearing Impaired

In fulfilling the mandate of the National Conference on New Directions for Captions to explore and support efforts to improve literacy among the hearing impaired, the Department of Education's Office of Special Education Programs (OSEP) established a new level of recognition of possible solutions. The Conference on Literacy and the Hearing Impaired, sponsored by OSEP, created an atmosphere which fostered the free exchange of thought, research, and advocacy in issues central to literacy and the hearing impaired.

A direction and a more clearly defined consensus now exists among Government officials, educators, researchers, technologists, and advocates in impacting illiteracy in the hearing impaired through captioning. By sponsoring a conference involving individuals with recognized expertise, the Department created a forum for the documentation, discussion, and synergy of ideas. Papers prepared for presentation at the Conference solidified the diversity of interests to the extent that common purposes could be pursued and, ultimately, that viable and pragmatic recommendations could be rendered.

Post-Conference Analysis of Recommendations

Recommendations

The recommendations which resulted from the papers, discussions, and work groups of the Conference focused on the following areas:

Additional responsibility for the Office of Special Education Programs,

Technology,

Research,

Professional development,

Material development,

Program development, and

Funding.

Participant Analysis

Following the Conference on Literacy and the Hearing Impaired, the Center for Systems and Program Development solicited responses from Conference participants. This provided a more precise analysis of the recommendations which resulted from the exchange of ideas. Participants were asked to prioritize the recommendations, select ten which they felt were most important, and comment on their selections.

The greatest proportion of responses (95 percent) favored Recommendation I.A. which states:

I. The Department of Education or Office of Special Education and Rehabilitative Services should assume direct responsibility for:

A. Establishing a clearinghouse(s) for information and research (past, present, and future) on literacy for the hearing impaired and technology (including captioning). (This clearinghouse[s] should [1] have a physical location[s] and office[s] that can be contacted or visited, as well as have resource information on a database; [2] compile, organize, and consolidate existing research on literacy and captioning to pay particular attention to the characteristics of both children and adults who have effective receptive and expressive communications skills and its carry-over into communicative practice);

While there appeared to be general agreement on this point by participants, one Federal Government respondent noted strong exception, suggesting that the establishment of clearinghouses could be handled as an Office of Special Education and Rehabilitative Services in-house function.

Another recommendation for the Office of Special Education Programs received sizeable support (54 percent of participants) in the post-conference survey was Recommendation I.D. which states:

I. The Department of Education should assume direct responsibility for:

D. Identifying the characteristics of effective literacy programs for the hearing impaired.

Some participants felt that efforts in this area should focus on pre-school, primary, special intervention, mainstreaming, and adult programs.

In the area of technology, a great amount of interest (77 percent of respondents) was expressed in Recommendation II.G. which reads:

II. In the area of technology, we recommend that:

G. There be research into issues relating specifically to the captioning process, including the speed of captions, the syntactic structure, verbatim/edited, caption placement, concept density, size, color, font synchronization of captions with speakers, and the use of "dynamic" captioning techniques. (This research should be conducted with a range of people of various backgrounds and ages, using various types of communication modes: hearing loss, first language, language level, socioeconomic variables, and additional disability conditions.)

Participant response was nearly as strongly in favor (69 percent) of technology Recommendation II.A which states that:

A. Research be conducted to determine the range of instructional uses of captioned television in literacy development (with different populations such as hearing impaired individuals, ESL, adult beginning readers, and learning disabled populations).

The analysis of post-conference comments indicates some trends of thought and reflections of preferences among the participants. Such appears to be the case with Recommendation VII.B. which was prioritized by 62 percent of the respondents and states:

VII. Program Development -- we recommend that:

> **B. Active involvement of hearing impaired persons on research teams including technological development projects along with practitioners, teachers, and other professionals in deafness be encouraged;**

The preponderance of positive responses focuses on the areas of Government responsibility, technology, research, the social components of literacy, professional development, and program development. Funding, however was also a specific area of concern for the respondents, 54 percent of whom listed Recommendation VIII. A. as being significant. The recommendation reads:

VIII.Funding -- in the area of funding we recommend that:

> **A. Funded research include as an essential aspect the means or mechanisms for implementation (translating research into practice).**

Conclusion

Although Conference participants expressed their preferences for selected recommendations, that in no way diminishes the importance of the remaining recommendations. When viewed in their totality, the conclusions reached during the Conference on Literacy and the Hearing Impaired provide a foundation on which to build and reinforce efforts to eliminate illiteracy in the nation's hearing impaired population. It should also be noted that the process of developing specific recommendations required individuals from different disciplines to reach a general consensus on some points on which there has existed general disagreement. After discussions on the efficacy of each recommendation, participants emerged from the Conference confident that progress had been made in establishing the most salient points to be considered in impacting the problem of illiteracy among the hearing impaired.

Conference Papers

PSYCHOLOGICAL PROCESSES: PROCESSES IN READING AND WRITING

By

Robert E. Kretschmer

Working Paper Prepared for
A Conference: Literacy and the Hearing Impaired

What We Know and Need to Know About Learner Competencies of Hearing Impaired Adolescents and Young Adults

Hosted by

Center for Systems & Program Development, Inc.

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INTRODUCTION

The last decade or so has seen a considerable resurgence of the interest in literacy - both in how it is established and how it is maintained. A number of professions have contributed to this resurgence of interest and each has contributed to the growing convergence on a common view of this notion. The present paper is an attempt to review some of these notions and to discuss them with reference to hearing impaired individuals, particularly those individuals defined as "school-leavers"1 in transition to the work world.

The approach taken in this paper is similar to that articulated in previous presentations and writings (Kretschmer, 1982; Kretschmer, in press) and is one that emphasizes reading and writing as processes. This orientation also focuses on the fact that the reader/writer is a socialized, or enculturated, information processor of printed text. In other words, this orientation emphasizes the fact that we are dealing with an (pro)active as well as reactive, physical, biological organism who learns, or fails to learn, primarily as a result of: a) his or her direct interactions with the environment and society (culture) and, probably more importantly, b) mediated experiences, as provided by significant others. So, we have an individual who is actively learning the reading/writing act(s) and how to become a speaker/

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1. A term borrowed from R. Conrad (1979) learning the culturally appropriate or sanctioned cognitive/social acts and behaviors associated with each role.

listener, reader/writer, consumer/producer of information.

As a result, the reading/writing act can and needs to be viewed from at least three perspectives: a) cognitive science or information processing, b) text organization and their social functions, and c) the processes whereby individuals are socialized to print. Each of these will be dealt with in turn in this presentation, followed by various concluding remarks and recommendations with regard to pedagogy.

INFORMATION PROCESSING ACCOUNTS OF READING AND WRITING

From the point of view of cognitive science, reading and writing are but two instances of how information is processed and displayed. As a result, it is helpful to understand how these processes work generally, for it is assumed that the more one can understand, describe, and explain how behavior is actually organized, acquired, and used, the better one is in a position to teach that particular skill or behavior, or, at least, to create an environment whereby the individual can display it. With this eventual goal in mind, let us begin.

Prior to describing the actual acts of reading and writing themselves, it is useful to first describe, in brief, contemporary thinking with regard to the organization of memory and how information is processed in general. The reason for this is that current thinking in the area of cognitive science suggests that memory structure is virtually fully equitable with personal knowledge; and, as a result, the study of memory is to have a window on the structure of knowledge. Additionally, the manner in which this knowledge or information is accessed, used, and added to reflects or may even be equitable with learning.

Current thinking with regard to these matters suggests that information is processed, "receptively", in three stages, though potentially at varying degrees of investment, or depths. These three stages are: the sensory register, short-term memory, and long-term memory. Essentially, at the sensory register stage, raw sensory data impinge upon and are registered with "the system." Although the mechanisms are not fully understood, it is clear that there is an interaction between long- and short-term memory and the sensory register, since, for example in the case of reading, it is well established that the eyes do not simply gloss over print material in a passive manner, but rather are purposefully directed from word to word (McConkie, 1982). In any event, this information is processed extremely quickly and is subsequently passed on to short-term memory, or what has been termed "working memory".

Again, the manner in which this is accomplished is still largely unknown, though it does involve some form of recording or encoding of the raw data into a more usable form - a form that will allow for easy access to and registry with long-term memory. In the case of reading, this typically involves recording the visual image of print into some acoustically phonetic pattern (or internal/inner speech) for most normally hearing individuals. With respect to hearing impaired individuals, this process might involve any number of possible encoding (recording) systems or combinations of systems, e.g., signs, finger spelling, acoustic phonetics, visual patterns or orthographic rules. The function of short-term memory is to serve as a "buffer" so as to afford an opportunity for the (re)codification of information of raw sensory data in any number of representational forms so that the information can be dealt with and incorporated into long-term memory. As might be expected, information can only be held in short-term for brief periods of time without recourse to some form of overt rehearsal strategy or pacing strategy. At this point, the processed and recorded information in short-term memory interacts with and is passed on to long-term memory and comprehension begins. "Supervising" all of these activities is an executive, metacognitive component (or function) which serves to: a) govern and monitor "online" processing, storage, retrieval, production, and maintenance of information and b) reflectivity (see Kretschmer, 1984 for a review of some of this material and a discussion of certain pedagogical considerations with regard to various metacognitive and metalinguistic issues as they apply to the teaching of hearing impaired individuals). Clearly, the use of some overt rehearsal strategy in dealing with information within short-term memory represents the application of this executive function and reflects what is referred to as "top-down processing" (as does the act of sending one's eyes to specific points while reading as discussed above).

The organization of long-term memory is very complex and, as indicated above, is generally regarded as being equitable with personal knowledge. Although a complete understanding of long-term memory and, thus, the structure of personal knowledge has not been achieved, it traditionally is divided into two parts - episodic and semantic memory - and it is thought to have multiple representations (e.g., imagery, perceptual experiences, schemes, conceptual networks, metaphors and abstract propositions). Episodic memory, in essence, is stored "personal experiences and their temporal relations" (Tulving, 1972). It is acquired for the most part through direct exposure to various stimuli, events, and behavioral models. Semantic memory, alternatively is thought to be comprised of: a) propositional or declarative knowledge, which basically is a rich lattice of interconnecting concepts, semantic relationships, principles and/or nodes, and subschemes that are adequately and clearly defined, appropriately and richly interconnected, and are mutually agreed upon by a "speech language community" and b) certain aspects of procedural knowledge, or knowledge of how to do some activity or how to get things done. Unlike episodic memory, both types of semantic knowledge are typically acquired via some mediational process. While episodic and semantic knowledge have been discussed in categorical terms, it should be noted that there is clearly overlap and interaction of these knowledge bases, as evidenced, for example in one's belief and value systems.

As can be surmised, the above description of semantic memory is tantamount to ascribing to a weak Whorphian hypothesis (e.g., Schlesinger, 1977) which posits: a) that knowledge is relative and a function of the knower (and, thus, may vary across individuals, age levels, and across cultures); b) that language, while not determining thought per se, plays a major role in shaping, clarifying, and drawing in the boundaries of various notions and concepts; and c) that this knowledge is acquired via an elaborate mediated, interfactional, enculturation process.

As can be seen, the above description portrays information processing as being an extremely dynamic interactional process rather than a passive one as suggested by behavioral and traditional cognitive approaches.

For normally hearing adults, the reading act seems to go something like the following: The reader, for whatever reason, intentionally and purposefully decides to engage in the reading act. This motivation for reading may have been generated previously in some other social-psychological-environmental context, or may arise out of the immediate social context, e.g., picking up a magazine while in a doctor's waiting room.

Additionally, depending upon one's motivation for reading and the social context, the individual may decide, to some extent a priori, upon the degree to which he or she will invest in the act and the depths to which the text will be processed. Once these, often instantaneous, decisions have been made, certain expectations and schemes (including general world and personal knowledge) are activated based upon prior knowledge or as the result of various environmental cues (e.g., the jacket cover, the title of the text, the art work, the format of the text, the placement of the text on the page, etc.) Then, the individual sets about the actual act of reading. In accomplishing this act, the reader sends his eyes from word to word in a left to right fashion (at least with respect to English), in part, as a result of some complex procedure involving the application of an individual's knowledge of semantics, syntax, text organization, and certain physical aspects of the visual stimulus, e.g., the spaces before and after individual words. Although it is not known exactly how it is that long-term, or for that matter short-term, memory interacts with the sensory register, it is clear that they do, as noted before.

As information is passed into short-term memory, the information is recorded or encoded into a form that is more usable and compatible with how information is stored in long-term memory. At this point lexical items, syntactic structures, and discourse structures are interpreted and are assigned specific meanings (i.e., are instantiated. For example, in the sentence. The boy earned a merit badge the lexical item boy would be assigned the meaning of boy scout based upon the additional associative information obtained from the phrase merit badge).

At this point, various inferences may be made, based upon linguistic/textual knowledge, prior knowledge, world knowledge, and knowledge derived from the text; certain anticipatory expectations may be confirmed or disconfirmed; and new ones may be set. Additionally, the individual's belief systems are activated and (s)he makes some decision, consciously or unconsciously, as to the degree to which (s)he will become self involved in the text. Once information is processed within short-term memory, it is then passed on to long-term memory where it is stored in specific subschemes, one of which is a constantly updated working model of the current text being read. Other related schemes and subschemes are activated, and this information is assimilated/ accommodated to one's general knowledge, if it is new. Throughout this process, the executive function is manipulating, tracking, and integrating multiple sources of information; determining the depth of processing; monitoring comprehension; adopting different perspectives; and selecting those aspects of the text to which particular attention must be paid.

If all goes well, the act goes forward flawlessly, but such is rarely the case. Individuals often misread and make misinterpretations of text. Good readers recognize that they have erred and will hesitate and engage in repair strategies such as rereading, etc. Poor readers, alternatively, often do not correct themselves and fail to activate, alter, or develop schemata properly as they read. These abilities seem to be related to cognitive style in that those who demonstrate field independence and reflectivity are better able to comprehend both familiar and unfamiliar text than are field dependent, impulsive individuals. This may be due to the former group's overall better metacognitive controls over their own cognitive processes (Egeland, 1974; Pitts & Thompson, 1984).

In essence, then, the reader/consumer of information is working hard to recognize the writer's plans and, thus, is a very active, responsible constructor of meaning, rather being a simple passive decoder of meaning.

With regard to writing, the process seems to go as follows: The individual, for whatever reason, has a felt need to communicate and, with respect to writing, (s)he intentionally chooses to do so via this medium, or else the situation, itself, dictates the use of this modality/medium. In doing so, (s)he decides that the material should serve some function which eventually must reflect the fulfillment of certain preconditions and assumptions in order to be a successful communicating piece of text. Depending upon the circumstances, the functions of the material to be written may be classified as interactional or poetic in nature (Kretschmer, in press) and the actual communication with the intended reader may be immediate (as in TDD talk) or delayed (e.g., electronic bulletin boards, books, articles, and newspapers). In any event, the act should be considered intentional, purposeful, functional, and as involving topic choice and an awareness of different communication functions and forms of writing. Once the topic and general form are chosen, a period of rehearsal or preplanning ensues, which may be quite extensive and may require sophisticated information gathering techniques and study skills, as in the example of academic writing. It also involves selecting and deciding upon the specific aspects of the intended meanings to be expressed and the manner in which they will be expressed, following something similar to Grice's (1975) maxims of conversations.

At this point, actual drafting begins; this involves selecting, structuring, and ordering explicit language forms so as to signal the intended meanings to the fullest extent possible and to assist the reader in tracking the information. In accomplishing this task, the writer is required to adopt a particular frame of reference (or thematic focus) and to hold, manipulate, distinguish, and reference multiple sources of information. Upon completion of, or while actually drafting, the text, the material is (re)read, silently or aloud, and reconsidered so as to monitor the meaning of the document in terms of clarity, completeness, cohesion, coherence, and appropriateness, after which the text is altered (edited) accordingly. Editing also occurs in order to take into account newly discovered notions or meanings generated as a result of the writing process itself. Editing usually begins first with issues having to do with meaning representation, followed by grammatical congruence, and, finally, spelling/punctuation correctness, though this is not to be considered an invariant three-step process or model. This drafting/editing process continues until the message is understood, or there is a feeling, rightly or wrongly, that the text is complete, comprehensible, and reflective of the writer's intent, sometimes determined in consultation with others. Thus, writing involves the interaction between the writer's tacit knowledge or conceptual schemes stored in long-term memory and the writer's strategies for translating information into text (Kretschmer, in press) in order to communicate with others or for self edification.

These plans and productions are typically constrained, however, by the writer's assessment of the intended reader's beliefs, knowledge base, and ability to understand the forms used and their intent. The act of writing/producing information successfully and competently is not just the "one way giving" of information, but as in the case of asserting it involves taking the listener's perspective and building a model of the reader's beliefs and abilities. Having done so, the writer, then, constructs an utterance that invites the reader to share a set of beliefs with him or her (Allen, 1983).

As can be seen, the above, somewhat over-simplified, descriptions of reading/writing and information processing, are very different from those traditionally portrayed. The picture presented is one where the reading and writing acts are highly interactional, mediated, and flawed processes that are heavily dependent upon and reflective of one's current state of knowledge and processing capacities at any given point in time. This is in opposition to the traditional, somewhat mythical, perspective which views reading as:

a) a passive decoding phenomenon wherein comprehension is built-up based upon the additive meanings of individual lexical items;

b) a situation wherein the passage is considered a self complete piece of text not requiring on going knowledge updating;

c) a situation wherein the reader comes naively to the print and where meaning and information are extracted from the text;

d) the application of various discrete but hierarchically organized skills and subskills;

e) a situation wherein the eyes passed over the printed page in an evenly paced manner while maintaining a large eye span;

f) a single fluent, non-faltering, phenomenon requiring no backtracking, not unlike a news broadcaster reading a script;

g) a subject to be taught during specific times, restricted largely to basal readers and the pleasure reading of literature, and emphasizing decoding skills and the total comprehension of the text, including the recognition and identification of minutia and details;

and, writing as:

a) an effortless linear process reflecting a stream of consciousness which can be produced swiftly and on demand;

b) talk put down on paper;

c) a silent solitary act;

d) going from thought to print;

e) a means of communicating only that which is already known;

f) a sequence of sentences each of equal weight with regard to their contributions to the meaning and organization of the text;

g) a unitary process;

h) a skill that is learned in an atomistic fashion and that is product-oriented.

GRAMMAR, SENTENTIAL STRUCTURES, AND TEXT STRUCTURES

Thus far, particular attention has been paid to the role of long-term memory in the reading/writing process. At this point it would be helpful to explore this notion in more depth.

The whole notion of long-term memory, at least with regard to language and text production/comprehension, rests with the notion of schema and schema theory. Schemes exist at a number of levels.

They exist at the lexical level (e.g., John killed Fred with a knife, which means that John caused Fred to become not alive by some means and in this case by means of a knife), at the sentential level (e.g., He ate at the diner. which entails that he ate something at the diner), the intersentential level (e.g., I walked into the room. The dinner setting was beautiful where it is known that the dinner setting was in the room), and at textual or discourse level.

Thus, grammar itself can be thought of a as form of scheme. Until recently the approach taken in the U.S., particularly in the area of the education of the hearing impaired with regard to linguistic descriptions, has focused primarily on the generative syntactic model proposed by Chomsky and to some extent the generative semantic approaches as outlined by Chafe (1970), Fillmore (1968), and Antinucci and Parisi (1976). While still important in explicating how phrase units are organized, how various sentences (proposition) relate to one another, and the internal semantic structure of sentences to some extent, these approaches are still sententially based and they do not typically address the semantic or pragmatic value of the grammatical structures themselves. An alternative, yet complementary, approach, is offered by the functionalist school which attempts to define the purposes of various syntactic devices (e.g., Levison, 1983; Halliday, 1985; Prince, 1985; Quirk, Greenbaum, Leech & Svartvik, 1970) and the mechanisms by which text cohesion is achieved (Halliday and Hasan, 1976). This approach could be used to bridge the gap between stylistics and grammar, more specifically:

a) how grammar can be exploited for certain effects

b) how certain grammatical structures are probably associated with certain textual types

Indeed, the present author would argue that certain texts and subject domains provide excellent opportunities to teach certain linguistic structures. For example, social studies tends to make heavy use of adverbials, particularly of time and place, truncated passives, and the present indicative, indicating habituality or a generality. Likewise, science texts make heavy use of the present indicative, while the setting portion of narratives makes heavy use of statives, as do certain kinds of reports (those emphasizing attributes). Other examples are the pronoun usages that signal the relationship between the author and his material or content and the use of adverbial adjuncts, which express various attitudes, judgments, and evaluations of statements, e.g., honestly, actually, surely, etc. In this regard, Biber and Finegan (1988) reported that eight clusters of adverbial adjuncts of stance could be identified which distributed themselves according to certain types of text.

As might be expected, these functional approaches in combination with generative model, other aspects of pragmatic theory and notions of text cohesion, e.g., the devices use to control the relationship between old and new information (the given-new contract) offer a fuller understanding of the organization of the English language.

At the textual level, there are a number of forms with which youngsters will need to be familiar, since not all textual forms are organized similarly. Additionally, it should be recognized that they do not entail the same themes, are not equally accessible to all readers (Spyridakis & Standal, 1987), are not equally as easy to process and recall (Ohlhausen & Roller, 1988), do not develop within children at an equal rate (Langer, 1985), and should not be confused with content or world knowledge schemes, since each makes its own contribution to comprehension (Ohlhausen & Roller, 1988). Within any text type, however, there are similarities. Kretschmer (in press) (based upon the work of Britton, Burgess, Martin, McLeon & Rosen, 1975; Kinneany 1971; Meyer and Freedle 1984; and Richgels, McGee, Lomax, and Sheard, 1987) provides a partial taxonomy of test types and genres. It is well known, though not fully researched, that each genre is organized and stylistically different.

CULTURE AND SOCIAL ASPECTS OF READING AND WRITING

The acts of reading and writing in the natural environment, as suggested above, do not simply exist within their own right. Rather, they exist within the context of social interactions and the culture at large. Within these social interactions, the acts of reading and writing may either be the central focus (e.g., negotiating the meaning or function of a piece of text) or they may simply serve as an ingredient of a social interaction. To some extent, the latter has been addressed previously in this manuscript, in that it has been noted that printed texts serve various functions and are regarded and valued accordingly. With regard to the former, the matter can be viewed either from the perspective of the individual (i.e., a social psychological perspective) or from the perspective of the acts themselves (i.e., sociological/anthropological perspective). Clearly, the two perspectives are not mutually exclusive, since the former assumes knowledge of the latter, and the latter subsumes the former. From the social psychological perspective, the issues have to do with the individual's socio-linguistic competency with respect to print, how it (print) differs from face-to-face communication, and the individual's metalin-guistic/metacognitive knowledge as to the processing and production of textual material. As for the sociological/anthropological perspective, the issues have to do with how literacy is defined, introduced, manifested, utilized, organized, and valued within the culture. It also deals with the issue of how literacy is associated with, reflective of, and determined by various formal and informal cultural institutions.

LANGUAGE, THOUGHT, AND AFFECT

Although primary attention in this paper has been directed at the cognitive and social aspects of literacy, the affective domain cannot be ignored. Just as it has been suggested that a significant relationship exists between thought and language, it is suggested that a significant relationship exists between these two notions and affect (Kretschmer, in press). Cognitive accounts of affect suggest that emotional reactions and their physiological manifestations are just that - reactions to automatic propositional thinking (Beck, Rush, Shaw & Emory, 1979) and that the relationship between cognition, affect, and language is often considered within the context of certain hypothesized constructs known as cognitive styles (such as reflectivity/impulsivity, field dependency/ independency, learned helplessness, and internal/external locus of control). The type of cognitive style (affective trait) acquired is believed to be the result of various positive (facilitative) or negative (non-facilitative) interactional patterns between the child and significant others.

Feuerstein (1979) has termed these interactions as mediated learning. Positive, or facilitative, mediated experiences are those in which significant others actively and intentionally assist the child in the learning process by framing, filtering, prodding, and focusing the child so as to make comprehension and production more organized, precise, and situationally appropriate and which assist the child in transcending the here-and-now. When appropriate mediational experiences are not afforded the child, he or she may develop certain cognitive and metacognitive deficits, resulting negative affective responses, and an impoverished knowledge base which directly and indirectly can affect the individual's acquisition of literacy skills (for more information see Feuerstein, 1979; Keane and Kretschmer, 1987; Kretschmer, in press, and Martin, this volume). From an anthropological perspective, this represents a breakdown in the intergenerational transmission of information (Feuerstein, 1979) or, in other words, a failure on the part of significant others, usually the caretakers, to orient the child adequately and appropriately to the significant features of the culture. In addition to having essentially intact cognitive functioning and presumably normal language abilities, the successful reader must have sufficient confidence to take risks and must demonstrate audience and personal awareness, the latter two of which seems to be related to the ability to anticipate others' thoughts and reactions (Kroll, 1983). Additionally, according to Williams (1985), the writer must be able to decontextualize language sufficiently to produce readable text which may be an expression of and be related to a field-independent cognitive style.

LITERACY SKILLS OF HEARING IMPAIRED INDIVIDUALS

The fact that many hearing impaired individuals have reading and writing skills in English far below their normally hearing peers is a well established fact. In the past, it has been said that these low achievement levels were related to difficulties in understanding and producing English syntax and a reduced vocabulary. While this undoubtedly is true, in part, other difficulties have also been noted. The semantic memory of deaf individuals not only has been characterized as having missing nodes (reflective of a reduced vocabulary) but also those nodes that they do possess are often less accurately defined and are based on associations rather than on semantic criterial features (Kretschmer, 1982; Strassman, Kretschmer, & Bilsky, 1987). In addition, there often are insufficient associative, connotative, hierarchical, and grammatical links among the nodes. Other difficulties that have been noted with hearing impaired individuals are: spontaneously instantiating particular meanings for general terms (Strassman, Kretschmer, & Bilsky, 1987); making certain types of inferences (Wilson, 1979); understanding and producing cohesion ties (Berchin and Kretschmer, in preparation; Yoshinaga-Itano & Snyder, 1985), understanding figurative language (King & Quigley, 1985 for a review); and making use of contexts (see Kretschmer, 1982 for a summary; Wilbur, 1977). On the positive side, Gaines, Mandler, and Bryant (1981) found little difference between orally taught deaf adolescent children who were very good readers and their normally hearing peers in terms of overall recall of text structures, Likewise, Gormley (1981, 1982) and Yurkowski and Ewoldt (1986) found that deaf children, like their normal hearing peers, make use of their prior knowledge in processing familiar and unfamiliar text. There is also evidence that young elementary aged hearing impaired children engage in reading and writing processes that are very similar to those of normally hearing individuals, at least in a general way (Ewoldt 1981, 1985). Other research, however, has noted that hearing impaired children often produce more poorly organized test (Yoshinaga-Itano & Downey, 1986) and it has been suggested that the non-reflective approach to task solutions may be linked to certain parent-child interactions and pedagogical practices (Quigley & Kretschmer, 1982; Keane & Kretschmer 1987; Kretschmer & Quigley, 1988; Mogford, Gregory, & Keay, 1978). Despite the fact that a great many hearing impaired individuals have poor English literacy skills, it has been noted that they deal with print on a daily basis. Blatt and Sulzer (1981), for example, found 80% of their adult deaf subjects read the newspaper daily and that a great many watched captioned television. Similarly, McLaughlin and Andrews (1975) found that hearing impaired adults read various forms of print, including books (particularly those which eventually had been made into movies). Presumably, they write as well, but to date little data is available as to the types of writing tasks they naturally engage in or how effective they are in producing and communicating in this mode.

EDUCATIONAL IMPLICATION

Based upon the information provided above, a number of possible education recommendations or implications are suggested.

Although a complete rendering of these educational implications is not possible, the following is a sample of a few of them.

First, since the evidence suggests that the acts of reading and writing are inextricably related, interactive processes that are facilitated by prior topic knowledge, a whole language, process approach to literacy which stresses the functions of text and the reading/writing connection would seem reasonable. Such an approach is process oriented and developmental in nature. Although skill development is not ignored, it is not approached as a hierarchy of discrete skills culminating in comprehension.

Rather, the approach emphasizes meaning and comprehension within normalized contexts from the very beginning. The approach also deemphasizes the use of basal texts. Alternatively, emphasis is put upon text forms that exist within the natural environment and children's literature. The teaching of literacy should not be restricted, however, to the use of basal readers, literature, or specific times of the day. Rather, literacy teaching should involve all forms of text and should be introduced and dealt with across the curriculum.

In approaching these materials (whether one uses naturally occurring text forms as suggested above or basal texts), the above mentioned information suggests that students be provided with advanced organizers, including semantic mapping, which would a) orient the youngsters to the task, the task's demands, and the skills needed to complete the task; and b) take into account the student's background knowledge and knowledge of textual forms. In those cases, where there is insufficient background knowledge, either the task should be abandoned in favor of another activity or the necessary background information should be provided. Additionally, emphasis should be put on assisting the child in: a) identifying and tracking central themes (e.g., story grammars or plots) and multiple strands of information (using techniques suggested by Omanson, 1982); b) identifying, comparing, contrasting, and producing various genres and/or themes; c) making inferences based upon contextual cues and prior knowledge; d) identifying the functions or intent of various textual forms; and e) developing various strategies to assist in information management and retention, including note taking, producing summaries and/or paraphrases of information, etc.. With older youngsters efforts at direct instruction, as has been tried with hearing individuals, might be profitable e.g., identifying typographical cues such as headlines, etc. (Taylor, 1982); identifying expository text structures and summarization (Armbruster, Anderson, & Ostertag, 1987), identifying narrative structures (Fitzgerald & Spiegel, 1983); using certain cognitive skills or acts (Duffy, et al., 1987); main idea comprehension (Bauman, 1984); anaphoric relations (Bauman, 1986); and certain writing skills (Taylor & Beach, 1984). Kretschmer (1984) cautions, however, that direct instruction presumes a certain level of metacognitive awareness and development which must be taken into account.

When approaching the issue of identifying or encoding various functions in textual forms, consideration needs to be given to highlighting those features (e.g., felicitous conditions) which serve to define those functions. For example, in the case of persuasive writing the individual needs to take into account the following features:

a) the author thinks that the reader should think X

b) the author knows that the reader doesn't want to think X

c) the author thinks (s)he knows why the reader doesn't think X

d) the author thinks (s)he can say things that will cause the reader to think about it in a different way

e) the author wants to say why (s)he thinks that the reader should think

f) the author says [...]

g) the author says this in this way because (s)he wants to cause the reader to come to think that the reader should think that X, and think that X (Wierzbicka, 1987)

Clearly, in doing this, the manner in which these points are organized or must be inferred from/implied within the text will need to be highlighted for the students. This will need to be done as a part of, or possibly above and beyond, the actual arguments or points being made themselves. In doing so, one must also take into account the actual grammatical, cohesion, and textual devices used and their functions in signaling these various intents and meanings. This approach not only addresses the conceptual underpinnings of the functions of texts, but it implicitly takes into account certain aspects of persona awareness and may assist in developing a notion of perspective taking.

The above is but one example. Similar analyses are available for other textual functions expressed as speech acts or speech acts verbs (Wierbicka, 1987). In addressing these issues, the pedagogy should make use of, as stated before, real or, at least, simulated situations where these behaviors can be modeled, elicited, and enacted.

One area which was not sufficiently developed in this presentation, but which needs to be mentioned briefly is the notion of metaphors and figurative language. In recent years, a number of interesting investigations have been conducted in this area. One notable investigation was that conducted by Lakeoff and Johnson (1980), the premise of which was that a number of idiomatic expressions were actually based upon various orientational, structural, or ontological metaphors that provide insights into the culture's value systems and conceptual organization of the world. For example, in our culture and language time is often used metaphorically like money; hence the phrase "time is money." As a result, each can be wasted, spent, lost, saved, etc..

In this presentation, I have tried to show that the reading and writing processes are very complex psychological and social phenomenon which are amenable to instruction and learning. It is the contention of this author, however, that instruction, in order to be effective, must be provided by a teacher who is conversant with contemporary theories of how these processes actually develop and work and how to translate these notions into practice.

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COGNITIVE PROCESSES AND THE HEARING-IMPAIRED LEARNER

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Introduction*

The question of intellectual potential in the deaf learner has puzzled educators, parents, and employers for centuries now. While pieces of this intriguing puzzle are clearly emerging and in some cases falling into place, the larger puzzle is far from definitively solved and continues to engage the interest of many, including the deaf community itself.

In the past decade, both interest in and proactive improvement of the intellectual performance of deaf learners within educational settings has been noteworthy; at the same time, heightened sensitivity to the needs of deaf persons both in schools and in the workplace have coincided with this trend. Thus, the 1990s may constitute a unique era in the education of hearing-impaired persons as an opportunity not only to examine what we have learned about cognition and deafness, but also to take some giant strides forward in both research on the subject and education of the public on the central issues within it.

Thus we arrive at a number of intriguing questions as educators:

- Do deaf learners learn differently from hearing learners?
- Do deaf learners have the same intellectual capacity as hearing learners?
- How have opinions changed in regard to the intellectual abilities of deaf learners?
- At what point is intervention effective in this area?

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- How can the intellectual capacity of deaf learners best be measured?
- How should educators of the deaf be best prepared to enhance the cognitive performance of deaf learners?

These questions and many more are highly engaging, and while they cannot all be answered in this paper, they can serve to form some advance-organizing principles for the analysis which follows.

Recent History

Pintner and others reviewed the available information on the intelligence of deaf persons and, in spite of sometimes contradictory results, concluded that deaf children had inferior intelligence (Pintner, Eisenson, and Stanton, 1941).

In 1924-1925, the National Research Council reported that the deaf were between two and three years "retarded" in comparison to hearing persons in their responses to the Pintner Non-Language Mental Test. On the other hand, Drever and Collins (1928) found in a study in Scotland, that on performance tests, the deaf were not more than one age level inferior to hearing persons, and they questioned whether or not deaf persons were at all retarded in intellect (McKane, 1933). McKane gave the Drever-Collins Performance Scale to both deaf and hearing subjects and replicated the conclusion that the deaf were not at any age level more than one year "retarded," although his study did not find any superiority on the part of the deaf at any age level. The study also found that deaf girls were inferior to deaf boys, and found no positive relationship between residual hearing and intelligence in the deaf group of subjects (McKane, 1933).

The work of Myklebust has been generally cited as another waypoint in the history of research on and attitudes toward the deaf. His work attributed a "concrete" nature to the intelligence of deaf persons, indicating that deafness restricts the learner to a world of "concrete objects and things" (Myklebust and Brutton, 1953). The influence of this attribution has been far-reaching in that educators of deaf children have for many years regarded the deaf learner as less able to work with abstract ideas; fortunately, subsequent research has proven this interpretation to be false. Nonetheless, the work of Myklebust represented one step forward in that he regarded the deaf learner as being at least quantitatively equal to the hearing learner, although inferior in quality.

Furth built on the work of previous researchers, and noted that it "would have been easy to assume from [the need to use simpler language] that the deaf were incapable of abstract thought which is so closely identified with verbal thought" (Furth, 1966). He wondered publicly about the causes to which one should ascribe deficiencies that make the deaf appear to be "concrete-minded," and deplored the past centuries during which the deaf were considered to be lacking in normal intelligence because they could not speak; he thus addressed the eternal question of the relationship between language and intelligence (Furth, 1966). Elsewhere, Furth (1964) concluded that the poorer performance of deaf persons on some cognitive tests could be explained either by a lack of world experience or by the conditions of those tasks that would favor a background of a spoken language. Further, he asserted that "the deaf" can comprehend and logically apply concepts as well as hearing persons can (1964). Originally, Furth (1964) asserted that deaf people grow up without a symbol system for communication; more recently (1973) he made a useful differentiation between symbol discovery, which is a more difficult process for deaf persons, as opposed to the use of symbols. A misconception, which has fortunately been corrected, was Furth's original assertion that deaf people have possibly a different cognitive structure because they "lack language" (1966); subsequent work by others has clarified that the mastery of a visual language system provides the opportunity for full language development; thus, today we are far more careful about distinguishing between "language" on the one hand and the use of a spoken system of communication on the other hand.

Rosenstein (1961), after a review of a number of studies conducted with deaf learners, found no differences between deaf and hearing persons in regard to conceptual performance when the linguistic elements presented were within the language experience of deaf children; his important conclusion was that abstract thought is not closed to deaf persons.

In a comprehensive review of 31 research studies using more than 8,000 deaf children whose ages ranged from three to nineteen, Vernon (1967) found that in 13 experiments, deaf subjects had superior scores to either the test norms or control groups; in seven studies, the scores were not significantly different; and in the remaining studies the deaf performed at an inferior level. His conclusion was that deaf youth perform as well in a wide variety of tasks that measure thinking as do other children (1967).

It is useful to review what researchers have reported in regard to specific cognitive skill performance in hearing-impaired subjects, skill by skill.

1. Memory: Research conducted over the last 80 years indicates that profoundly deaf subjects perform less well than do normally hearing subjects on short-term memory tasks as well as on certain other cognitive tasks (Karchmer and Belmont, 1976, p. 1). In a report on the results of a cognitive laboratory study, deaf subjects benefited greatly by adopting particular strategies that explicitly tailored the primary and secondary memory systems to the demands of information processing. These strategies brought their performance up to the levels that the hearing subjects had achieved using self-selected strategies (Karchmer and Belmont, 1976, p.4). Karchmer and Belmont concluded that what is often seen as a performance deficiency is instead a strategy deficiency, as opposed to some type of structural deficiency related to the physiological fact of deafness (1976, p. 8).

   Meadow reported that hearing-impaired children could better remember words that had a sign equivalent than words that did not. Further, she found that hearing-impaired children found it easier to remember geometric shapes than to remember digits (1980, p. 73). Thus, classroom intervention programs (as discussed later in this volume) that stress the direct teaching of particular strategies for cognitive tasks should hold promise of improvement of hearing-impaired subjects' performance in cognitive problem-solving situations.

2. Concept Application: Furth asserted that "the deaf" can comprehend and logically apply concepts as well as the hearing can (1964, p. 168). More recently, Meadow reported that hearing-impaired subjects learn concepts in the same sequence as hearing subjects, but at a later time (1980, p. 72). Furth remarked that the difficulties experienced by hearing-impaired subjects in several skill areas indicated that they have difficulty with the discovery of a concept rather than with its comprehension or use (1964, p. 146).

3. Part-Wholes: Furth found no difference in the performance of deaf as compared to hearing children (1964, p. 146).

4. Opposition: Furth found inferior performance among deaf subjects on this dimension (1964, p. 146), and the same finding was reported later by Meadow (1980, p. 72).

5. Sameness: Furth found the deaf subjects to be "equal" to the hearing subjects on understanding of sameness (1964, p. 146), and Meadow reported "little retardation" for hearing-impaired subjects in this domain (1980, p. 72).

6. Analogy: Meadow reported that hearing-impaired children had difficulty in this area (1980, p. 72).

7. Superordinate Reasoning: Meadow found this area posed difficulty for the hearing-impaired subjects (1980, p. 72). Johnson (1981) has reported that both the vocabulary and concept of cause-effect relationships are also more difficult for hearing-impaired youth.

8. Symmetry: Both Furth (1964, p. 146) and Meadow (1980, p. 72) found little, if any, difficulty for hearing-impaired children in this skill.

9. Classification: Prior research has reported that hearing-impaired children perform less well than hearing children on classification tasks that depend on verbal interaction with the environment (Best and Roberts, 1975). However, more recently, Meadow has found little retardation among hearing-impaired learners in this skill area (1980, p. 72).

10. Spatial Reasoning: Research thus far on this area suggests that because hearing-impaired children depend primarily on visual and tactile senses to a greater degree than hearing children, they may develop a different concept of space (Hauptman, 1980, p. 43). In a separate study, Parasnis and Long (1979) found that deaf students are more field-dependent when compared to hearing students and that spatial skills are significantly related to performance on a field-dependence test. They have suggested that the effect of auditory deprivation and/or knowledge of sign language for congenitally deaf individuals may be weak cerebral lateralization and thus greater field-dependence.

Thus, we can anticipate that a hearing-impaired child, whose cognitive style preference is for spatial reasoning, will have difficulty with nonspatial cognitive tasks. Some researchers assert that a hearing-impaired child who uses visual communication systems may be using the right hemisphere of the brain; therefore, cognitive tasks of a logical/sequential nature requiring left-hemisphere activity may be understandably difficult. This area remains controversial.

11. Working with More Than One Type of Data: Recent research (Ottem, 1980) indicated that hearing-impaired learners experience more difficulty on tasks requiring reference to two items of data than do hearing individuals. This research placed the fault with the hearing world, which has imposed on the deaf population a requirement about simple and unambiguous communication that is obtained by referring to single events.

12. Linguistic Abstraction: Hearing-impaired adults are reported to be able to abstract and integrate the semantic content of sentences into holistic semantic ideas (Brewer, Caccamise, and Siple, 1979, p. 22). Brewer et al. suggested that the abstraction process itself is a basic cognitive process whose functioning is "quite ubiquitous" and that the way in which the process operates in an individual is related to world knowledge and experience as well as to linguistic skills. But, they note that further research on children is needed in this area. Moores (1978) also challenged the traditional notion that hearing-impaired children are concrete thinkers, and he found no evidence to support that hypothesis (p. 137).

13. Use of Symbols: Furth (1964) remarked that deaf people grow up without a symbol system for communication, but a careful reflection on the nature of manual systems would seriously challenge his point. Manual systems of communication are also clearly based on symbols. More recently, however, Furth has implied that deaf people do use symbols. He noted that among deaf adolescents, symbolic life is simpler, more reality-oriented, and more firmly anchored in the self (1973, p. 49). He also made a useful differentiation between symbol discovery as a process and the use of symbols, and he reported a study in which 16-year-old deaf students were found to be significantly behind their hearing peers in discovery of symbols (1973, p. 59).

    The crux of Furth's approach was the assumption derived from Piaget's work that intelligent thinking is not based on language, but is an internal process independent of language (Furth, 1964, p. 228). Moores challenged Furth's position as failing to demonstrate that deaf people lack language or are inferior at the formal operational level (Moores, 1978, p. 134). In fact, Suppes (1972) argued that deaf people are indeed using a type of language, but are using it internally (p. 41). Moreover, Debes and Williams (1978), in a seminal paper on visual literacy, indicated that for a person reading manual communication, no cognition occurs that is separate from or not based originally on signs that have been read (p. 142).

In recent years we have also witnessed a trend to actively intervene in the cognitive performance of deaf learners in terms of efforts to improve that functioning; these efforts are indicative of an encouraging philosophical point of view that maintains that deaf learners have the same range of intellectual potential as the hearing population and can achieve that potential if the environment, instruction, and materials are appropriate. In the later section of this chapter on Cognitive Interventions, the results of these efforts will be examined further. The results thus far can be summarized by the statement that indeed that potential is beginning to be realized.

As we then look backward at the history of attitudes toward the cognitive potential of deaf persons, we can identify a trend that passes from outright bias and in many cases discrimination, through the several phases of comparing deaf and hearing learners on some more specific measures but still over-generalizing or oversimplifying the results, through a period of more systematic analyses which remove the tendency to over-generalize but still confuse the thinking and language issues. The history then moved to a time when the performance of deaf persons began to be analyzed on its own terms and with a better understanding of the particular conditions under which a deaf learner develops; and that phase led in turn to the present time when those more specific analyses continue side by side with active efforts to improve cognitive performance of deaf learners in the firm belief that such improvement is not only possible but essential to accomplish.

Current Issues

1. Neuroscience

The fascinating area of neurological organization in the deaf learner, as compared to the hearing learner, has received much focus in recent years. The temptation is strong to become reductionist in terms of attributing most differences between hearing and deaf persons to differences in brain organization alone. While it is important to resist that temptation and to remember that much research remains to be done and that there remain also other social and psychological factors, it is nonetheless useful to examine what the research to date has indicated in regard to the organic aspect of these differences.

The research on deafness and the specialization of the brain hemispheres has been in some cases ambiguous because of difficulties with research methods; however, there is evidence that deaf persons do not have the same specialization in the left hemisphere of the brain for language functions (Kelly and Tomlinson-Keasey, 1977; Phippard, 1977). We know that deaf adults who have had deaf parents, have used sign language from birth, and have various types of aphasia as the result of strokes do show left hemisphere specialization for language and right hemisphere processing in the visualspatial area, as is found with most hearing persons (Bellugi, 1983). The conclusion from this finding is that the difference in lateralization is not the result of auditory deprivation or deafness, but rather is the result of a lack of early language stimulation (Kusché, 1985).

The implication of such findings is clear in terms of intervention at an early age with the deaf learner, so as to work at reducing or preventing deficiencies in linguistic processing, memory, reading, and hemispheric specialization.

At this time, even though research has indicated that hemispheric differences exist between hearing and deaf persons in processing both non-linguistic and linguistic stimuli, it is not clear whether these findings represent differences in brain organization, or information-processing strategies, or both (Greenberg and Kusché, in press). In addition, it is essential to remember that the deaf population is by no means homogenous in regard to hemispheric specialization; the factors of linguistic skill, proficiency in verbal and sign language skills, genetic factors, and early environment are all important to the development of cerebral specialization (Greenberg and Kusché, in press).

To further complicate the topic, the research on handedness indicates that deaf children do not appear to be as strongly lateralized as hearing children when hearing losses are greater than 90 dB (Weston and Weinman, 1983). Hearing boys appear also to be more strongly right-sighted then deaf boys but the same differences are not found for girls (Gottlieb, Doran, and Whitley (1964). And the work of Boyd (1967) indicated that deaf children showed better performance with their least preferred hand in regard to speed of manual dexterity.

2. Cognitive Processes

Cognitive style is a theoretical construct which has some useful classroom implications. An important dimension of cognitive style is the continuum of field dependence. A style of field-dependence is the tendency to use external referents, to experience surroundings in a rather global fashion, and to passively conform to the prevailing context. On the other hand, field-independence is the tendency to rely primarily on internal referents and to perceive one's surroundings analytically, experiencing objects as separate from their backgrounds. A study by Gibson (1985) indicated that the differences in developmental pattern on this dimension are not attributable to degree of hearing loss or age of onset of hearing loss; this finding indicates that deaf persons can have access to cognitive restructuring skills regardless of their location on the field dependence/independence continuum.

The topic of metacognition is an important one in the field of cognitive education. The term refers to the process by which a learner monitors, consciously plans, and retroactively evaluates the mental processes by which he or she solves a particular problem. However, it is useful to ask about the facility which deaf learners have in carrying out this process, which is considered to be essential in becoming a better thinker. Several experiments have indicated that indeed the deaf learner is as capable as the hearing learner in carrying out metacognitive activity. In an experiment on the metacognitive awareness of deaf adolescents, Clark (1985) studied students' metacognitive knowledge of reading as reported by the learners themselves. She found that the deaf adolescent reader, whether strong or weak as a reader, had the rudiments of metacognitive awareness of all reading areas studied, and found that deaf and hearing readers demonstrated similarity in that regard.

In an excellent summary of the findings to date on the cognitive development of hearing impaired learners, Greenberg and Kusché (in press) indicate that deaf children first begin to show developmental delays near the end of the preschool years. Delays involving visual attention and perception do not appear to be serious, but when visual perception leads to incorrect inferences, some significant delays are seen. A large body of data indicates that deaf learners rely heavily on visual-spatial perception and processing, and have strength in simultaneous visual processing which is holistic. As indicated above in the section on the organic or neuro-anatomical aspect of cognition, weaknesses among deaf learners are found in verbal-sequential and abstract processing. Greenberg and Kusché posit that the linguistic deficits among deaf learners result in some experiential deficits, and those deficits in turn affect some areas of cognitive development and information processing. For example, appropriate labeling and categorizing information in linguistic form can lead to changes in the learner's visual perception of reality and then in turn contribute to the formation of new concepts.

Every school subject area has certain cognitive prerequisites which are essential for progress within those subjects. A clear example would be the area of reading comprehension. Various researchers in the field of reading have used what is known as schema theory (Rumbelhart, 1980) to develop better understanding of the reading process. The theory incorporates the use of schemata, the process of spontaneous comparison, and categorization--all important to the reading process; this approach views reading comprehension as the process of correctly accessing a cross-indexed conceptual filing system (Berchin, 1989). One may explain this notion of a file by thinking of each concept as having its own file in the mind, and the learner adds to the file by relating additional information to it, but the incoming information must also be related to what is already in the cognitive framework--in this way, the individual uses existing knowledge to expand upon incoming information and that process leads to the best opportunity for comprehension (Berchin, 1989). A strong explication of these ideas can be found in the work of Collins and Quillian, 1969; Collins and Loftus, 1975; and Kintsch, 1977.

Prior research has indicated that deaf learners have restricted semantic fields (Restino, 1969), and have difficulty in word definitions (Silverman and Rosenstein, 1969). Hearing-impaired children are similar to hearing children in their use of semantic clustering for the grouping of words (Hoemann, Andrews, and DeRosa, 1974; Tweeney, Hoemann, and Andrews, 1975; Liben, 1979), but they have a comparatively lower ability to recall categorizable items.

The work of Feuerstein (1980), explained elsewhere in this paper in regard to the program Instrumental Enrichment, provides classroom teachers with a specific intervention program that focuses on the development of particular cognitive skills, followed by particular activities in metacognition and opportunities to apply those skills to subject matter. Within that program are activities in both comparison and categorization, which are directly applicable to improving the performance of deaf readers.

An experiment conducted by Berchin (1989) examined the effect of the spontaneous comparison and categorization activities within the Instrumental Enrichment program on the reading comprehension of a group of deaf learners. Results indicated a significant treatment effect for the subjects in reading comprehension, in addition to their acquisition of the operation of categorization itself; in addition, they indicated a near-transfer of spontaneous comparison. A critical component of this intervention is the process of mediation, in which the instructor assists the learner through a variety of strategies including probing questions, suggestions of alternative strategies, and assistance with interpreting the stimuli of the problem. The results of this study are consistent with other studies done by Keane, 1983; Krapf, 1985; and Martin and Jonas, 1986. A particularly critical component within the mediation activity is the step of input manipulation, which is supported by the prior research of Huberty and Koller, 1984, who found that deaf learners may have more difficulty with initial input of information than hearing persons. This study, then, adds to the growing corpus of work supporting the importance of carefully trained teachers in the mediation area using appropriately selected cognitive materials for the enhancement of cognitive skills in deaf learners.

3. The Role of Language in Cognition

a. Traditional Views

We have alluded numerous times to the interaction between language and cognition. This critical area has been a source of puzzlement to researchers and educators for many years. The general theories in regard to this topic can be divided into many categories, but two would be psycho-linguistic and socio-linguistic. The psycho-linguists focus on the behavior underlying the development and use of language on a psychological level, and the work of Vygotsky is an important example of work in that area. Socio-linguists, on the other hand, try to explain the relationship between language and thought using observations of the social use of language, distinguishing between language used in formal versus informal communication. These two broad categories of theory should be brought to bear on the topic of language and cognition in the hearing impaired as well.

Quigley and Paul (1984) underline two questions that have engaged the interest of investigators in the past:

> (1) whether quantitative or qualitative differences exist between deaf and hearing people in various dimensions of cognitive functioning, and

(2) whether there is a relation between language and thought, and if there is one, its nature.

In the field of linguistics, the argument about the primacy of language over thought or thought over language has been a long-standing one. The work of Benjamin Whorf concluded that language determines thought (known as the Whorfian Hypothesis). However, studies of hearing children by numerous investigators with deaf children have indicated that much perceptual and cognitive development takes place prior to language development, and thus does not support the view of Whorf (Quigley and Paul, 1984). A weaker form of the Whorfian Hypothesis indicates that although language does not dictate thought, it nonetheless has a significant influence on it; it is probable that most educators would agree with this view, and it remains for additional research to study this interaction more directly (Quigley and Paul, 1984).

Cognitive theorists oppose the idea that language is independent of other cognitive processes, and state that language is a "mapping out" of the cognitive skills that the individual has at that moment (Quigley and Paul, 1984). Most educators today would probably agree that the argument about origin may be, if not specious, at least an untestable one at this time, and that the critical point is that language and thought are at least interactive. In the meantime, additional studies are under way on this fascinating topic, and it behooves all educators and others who work with hearing-impaired persons to watch closely the results of these investigations.

A major problem in understanding the relationship between language and cognition in deaf persons is the mode of communication; spoken languages and manual languages use very different ways of expressing ideas. As was mentioned in an earlier section, spoken languages use mechanisms based on sequence while manual or visual languages use mechanisms based on spatial relationships. Yet, the reader will recall that in the section above on neuroanatomical aspects, there is still no strong evidence to support major differences in brain functioning between hearing and deaf persons at this time. Rodda and Grove (1987) correctly criticize the continuing trend to regard speech, American Sign Language, English, thinking, and auditory or visual perception as separate systems; instead they call for investigators to focus on the underlying and integrative cognitive processes and their neurological representations.

Considerable research has indicated that prelingual profoundly deaf persons rarely, if ever, reach high levels of proficiency in spoken language structures (Rodda and Grove, 1987). Numerous detailed summaries are available on this topic, and do not need further elaboration at this point; however, the implications for the workplace are clear--adjustments and accommodations on the part of the hearing persons in the work environment are as important as adjustments and accommodations on the part of the hearing-impaired worker.

b. Current Theories

In their penetrating analysis of language and cognition in regard to deafness, Rodda and Grove (1987) identify two general problem areas for the deaf language user. The first is the difficulty in coping with the complex rule systems of English grammar, and the second includes processes such as relative clauses which involve resequencing and transforming entire segments of discourse. Further, in spite of some areas of performance in which hearing-impaired children perform better than hearing children, hearing-impaired children consistently perform lower than hearing children in short-term memory and skills in the English language. These authors indicate a relationship between memory and English skills in the ability of deaf children to develop phonological codes, thus implying the need for alternative strategies in visual coding. Some years ago, in fact, Vygotsky expounded on the notion of "polyglossia" which in modern terms would mean the acquisition of language (not speech) by any and all means possible, as the unique feature of the deaf child's development and as the most productive path to the child's intellectual growth (Knox and Kozulin, 1988).

We are led, then, to the current conviction that language development occurs in numerous ways, and that for the deaf learner a manual form of communication may be essential for that development, although there are some children for whom oral methods seem to be adequate. Rodda and Grove (1987) underline that a manual form of communication is a more effective medium of reception than lipreading for the majority of severely prelingually deaf persons; for those hearing-impaired persons for whom sign language is their first form of communication, signs are easier to perceive and process than lip movements. But sign language alone is somewhat less effective overall than Total Communication and much less effective than reading. They indicate that the relevant data would render the oral-manual controversy somewhat absurd, since neither oral methods nor manual methods alone are best; instead, both are inferior to a combination of methods and reading.

Genuine conclusions about the topic of language and cognition in the deaf learner are, as is evident, not possible at this time in any large-scale sense. While the continuing development of new data is exciting and the opportunity for additional research is appealing, it is at the same time perplexing for the professional practitioner to derive a clear sense of action for her or his work with deaf persons. The most appropriate course of action for practitioners would seem to encompass at least the following principles:

1. Provide the deaf learner with all possible modes of communication,
2. Become proficient as a professional in as many of those modes as possible,
3. Actively encourage colleagues to do the same,
4. Maintain high expectations for the deaf learner since no evidence suggests anything other than the same range of intellectual potential for deaf persons as exists among hearing persons,
5. Orient employers to provide a work environment for the deaf person which reflects these ideas,
6. Insist that professional journals provide a balanced coverage of research in this field,

7. Remain an enthusiastic consumer of that research through professional conferences and professional reading

8. Encourage deaf persons to become trained researchers, and

9. Encourage deaf clients and students to participate in carefully controlled experiments to further answer the many puzzling questions in this fascinating field.

Assessment of Cognitive Performance

Another of the critical issues in the cognitive performance of hearing-impaired persons is the appropriate assessment of both the performance and the potential of deaf learners. At several points previously in this chapter, we have implied that the area of assessment has resulted in some unfairness in the past, and we have also alluded to some of the varieties of measures that are being used at this time. As was noted earlier, traditional measures of intellectual performance sometimes include only a verbal dimension, which in many cases is not an appropriate assessment for a deaf learner; however, some other instruments do employ both verbal and performance dimensions. Still another approach to the fairness question relates to the presentation of the verbal materials of such measures but using sign-language versions during the presentation.

Miller (1985) developed a signed presentation of the verbal scale of the WISC-R for testing profoundly deaf children. Findings indicated that this version produced a more complete profile of the deaf learner, and revealed that non-signed versions can prevent the deaf learner from receiving the entire message from the tester, and therefore a less than complete profile is obtained for those learners. Luetke-Stahlman (1985) makes a strong case for approaching assessment of the cognitive potential of hearing-impaired learners by using cognitively demanding but context-reduced measures.

The work of Feuerstein (1979, 1980) assesses cognitive potential through a system which first attempts to teach the cognitive skill to the learner and then (and only then) tests for it, thus removing any effect of cultural disadvantage. When applied to deaf learners, it was found that deaf persons upon being given mediated intervention performed significantly better than a comparison group using traditional psychometric procedures (Keane, 1983; Keane and Kretschmer, 1983).

The tendency to rely on only the performance measures of I.Q. tests when working with deaf learners is a clear attempt at fairness. However, the recent work of Braden (1987) indicates that the performance I.Q. tends to obscure important differences between children who are hearing, children who are deaf from hearing parents, and children who are deaf from deaf parents; thus, it is necessary to develop and implement alternative forms of measurement.

Therefore, the state of the art in the appropriate assessment of hearing-impaired learners is still at a fluid and in some cases even early stage; it behooves anyone working with deaf learners or deaf adults in the workplace to demand balanced assessment measures which will be interpreted on their own terms and in the context of the specific history of the deaf individual and her or his etiology. The next five years show promise of important improvements in the assessment of cognitive potential for deaf persons.

Intervention Strategies: Learning to Learn

a. Theoretical Bases

The data that have been reviewed and the conclusions from the more recent studies have all led to a consistent picture: not only are deaf learners capable of the same range of intellectual performance as their hearing counterparts, but it is possible to improve the intellectual functioning and cognitive potential of deaf (and hearing) learners. This latter implication, however, requires special interventions and appropriate pedagogy on the part of appropriately trained instructors. This final section, then, is a review of work that is under way to carry out productive intervention in improving the capacity of the deaf learner to learn.

The authors of one particular thinking and language skills program for hearing-impaired students have pointed out that thinking skills are not only essential to the development of reasoning and critical thinking, but also are fundamental to the child's total learning ability. These skills include the ability to recognize relationships, store and recall information, recognize logical order, evaluate information, do original thinking, adapt the known to new situations, do trial-and-error thinking, and acquire an understanding of different types of concepts (Pfau, 1975, p. 4).

Furth has defined logical and conceptual thinking as the tendency toward an intellectual grasp of reality undistorted by symbols (1964, p. 187). Bruner (1969) has described thinking as a process originating with problem-solving strategies that are originally developed in acquiring specific skills. While Furth's latter point about symbols in the thinking process is debatable, these definitions provide a working tool for examining the need for curricular interventions for hearing-impaired populations, as will be discussed later.

An interest in cognitive training began to emerge in the late 1960s and early 1970s when researchers from several different orientations within special education began to focus on self-control processes. A longer tradition exists in teaching general and task-related strategies to exceptional children (Meichenbaum, 1980, p. 84). Among the relatively recent trends is a technique called cognitive behavior modification (CBM), which is defined as the student acting in some way as his or her own trainer or teacher through self-control, self-verbalization, self-instruction, and self-reinforcement. Verbalization by the student of what the student is doing is another trait of this technique. CBM also often involves identifying a series of steps or strategies for problem-solving (Lloyd, 1980, p. 53). Unlike CBM, in which a single general strategy is taught, another approach called strategy training teaches specific strategies for specific types of problems through a rote set of sub-skills and rules for combining them as applied to a class of problems (Lloyd, 1980, p. 59).

A characteristic of some CBM programs is metacognition, which is defined as one's cognitions about cognitions, or the thinking about one's own thinking. The processes involved here include analyzing the problem, reflecting on what one knows that may be appropriate to a solution, devising a plan, and checking one's progress (Brown, 1978). Exceptional children have been considered to be deficient in metacognition as well as in certain academic areas.

Impulsivity is another characteristic of some learners who are achieving below their potential. One deficiency in the impulsive learner has been in the area of well-developed habits of self-observation (Gutentag and Longfellow, 1977), which is related to the skill of metacognition. Jerome Kagan's work (1971) has been significant in identifying impulsivity (versus reflectivity) as a learning style and the attendant problems that impulsivity brings. A number of teaching strategies have been evolved for teaching the impulsive learner; among them, strategy-training has been experimentally demonstrated to be effective in making the learner operate in a more reflective manner (McKinney and Haskins, 1980, p. 48).

Systematic intervention programs, then, for working with the cognitive deficits of exceptional children are not new phenomena. Such intervention techniques as those just mentioned have had varying success. That success has been related to certain identified variables. For example, it has been shown that a child's concept of causal relationships influences his or her reaction to an intervention program (Henker, Whalen, and Hinshaw, 1980, p. 23). In addition, individual differences in language and cognitive maturity are also considered to be influences on the appropriateness and effectiveness of cognitive training interventions (Keogh and Glover, 1980, p. 79). One unresolved question is whether an intervention that is ineffective may be trying to use nonexistent prerequisite skills in the child when it should be developing those prerequisites (Keogh and Glover, 1980, p. 81).

Intervention programs used until now have had limited success in the critical area of generalizability (i.e., the transfer by the learner of learned skills to other areas where those skills can be appropriately applied). It has been suggested that generalizability may be limited by the strategies themselves; that is, transfer to a novel task with similar stimulus and response properties presents no difficulty, but transfer to a task involving different materials and responses is often not obtained (McKinney and Haskins, 1980, p. 49). On the other hand, generalizability across training programs appears more likely as a child matures because older children are more aware of the strategies available to them (Loper, 1980, p. 6). It has been recommended that generalizability can be enhanced if the training procedure ensures explicit feedback and includes direct instruction in generalizing (Meichenbaum, 1980, p. 86).

While few of the previously mentioned researchers have focused on the hearing-impaired learner, their work with exceptional learners in the cognitive realm suggests particular points of rationale for this volume.

Studies of cognition in relation to the hearing-impaired population have also been numerous in recent years. After an initial focus on I.Q., the center of attention now is on the processes involved in cognition and perception. It appears to be a well-accepted fact that hearing-impaired subjects have the normal range of intelligence when tested on performance, rather than the verbal, subtests of various I.Q. instruments (Drever and Collins, 1928). An exception is found in students who have neurological impairments in addition to their hearing loss (Vernon, 1968, p. 8). In a more detailed examination of hearing-impaired subjects by specific etiology of loss, Vernon found some differentiation in performance; for example, the mean I.Q. for genetically deaf students was reported to be 114, while that for postmaternal rubella deaf students was 95 (1968, p. 7). We also know that when the influence of age is controlled, statistical data on hearing-impaired children indicate strong relationships between achievement test scores and variables such as age of onset of hearing loss, cause of loss, degree of loss, additional handicapping conditions, ethnic background, and type of special educational program (Jensema, 1975).

In summary, then, current theories about cognitive interventions and the potential for learning how to learn are based on a philosophy that high expectations are appropriate and that we are still in an era where much is yet to be learned; therefore, an open mind and a thrust toward further empirical investigations are most appropriate guiding principles. Let us look now at some of the specific cognitive intervention programs and their findings to date.

b. Applications

The specific types of intervention for promoting the capacity for learning in the deaf learner have included: special programs developed by teachers, commercial programs adapted for use with the hearing-impaired learner, and other cognitive education approaches which have been adopted for use with hearing-impaired classrooms. Some of these interventions have had anecdotal information gathered about them, while others have had more rigorous empirical studies conducted around them. In some cases, the programs used have required special in-depth teacher training or re-training, while others have been incorporated with a minimum of teacher re-training. All, however, have theoretical bases that share the common persuasion that the deaf learner is capable of improved cognitive performance from where he or she is at the moment of beginning the intervention.

One example of a teacher-developed program would be the one developed by Dietz (1985) in which the computer program LOGO was used to promote an understanding of geometric concepts by focusing on the abstract, non-graphic list-processing abilities of that particular computer language. Students were reported to become more persistent with dealing with difficult problems, and willing to explore on their own without continuous feedback from the teacher; evidence of improved and extended planning behaviors was also reported for the high school hearing-impaired learners in this small study. A separate study with elementary-age hearing-impaired children by Luft (1985) using LOGO found that students developed new insights into how to become more precise, took more risks in problem-solving situations, and developed a better motivation toward achievement.

The Philosophy for Children program (Lipman, Sharp, and Oscanyan, 1980) was applied to hearing-impaired children in the context of philosophical inquiry in a small-scale study in a day school for the deaf (Rembert, 1985). The program, which emphasizes philosophical dialogue, was reported to result in a more clear expression by students of their ideas, more tolerance of the opinions of others, a strengthening of analysis skills in school subject areas, and greater patience in carrying out philosophical inquiry.

Martin and Jonas (1986) studied the effects of the program, Instrumental Enrichment, developed by Feuerstein (1980) with an experimental and a control group of hearing-impaired adolescents over a two-year period. The program requires teachers to use specific paper-and-pencil exercises on such cognitive skills as comparison, analysis, classification, and sequence, and to mediate students' reflection on the cognitive strategies they have used (metacognition), and then helping them to make applications (bridging) to the subject matter under study. Special in-depth teacher training is needed to implement the program. Results included significant improvement in tests of reading comprehension, mathematics computation, mathematics concepts, logical reasoning, as well as the observed application of greater detail, better organization, and greater precision in posed problem-solving situations. Teachers not involved with the implementation also reported that Instrumental Enrichment students in their classes demonstrated improved attention to detail and a tendency to explore alternatives to solutions to a problem in the subject matter context, as compared to students who had not had this intervention. These results have been replicated in a study by Craig (1989) in another school, using the same approaches with similar methods of assessment. Similar results were noted in an application to the college-age hearing-impaired learner in another study using the same methodology and the same program (Martin and Jonas, 1987).

Another investigation (Keane and Kretschmer, 1987) found that the Feuerstein approach of mediated learning as outlined above also resulted in significant transfer of learning on other cognitive and behavioral measures not associated with the teaching method itself (Instrumental Enrichment).

Another study (Krapf, 1985) with deaf adolescents using mediated learning experiences similar to Instrumental Enrichment demonstrated that this approach has a measurable and positive impact on figural analogic reasoning; it was also found that deaf adolescents as a result of this methodology can use two or more sources of data if mediation takes place, and students were found to be capable of using metacognitive problem-solving skills in the sense of being able to explain why certain strategies did or did not work. The results of this study also demonstrated that deaf adolescents after mediation will use symbols and operations that reflect symbolic relational thought--that is, formal operational thinking. Still another study with Instrumental Enrichment and deaf adolescents at the North Carolina School for the Deaf (Haywood and others, 1988) found significant positive effects from Instrumental Enrichment on students' reasoning aptitudes, although sharing inconsistent effects on achievement in academic areas.

In an active intervention with the hearing-impaired child's cognitive development, Yoshinaga and Downey (1986) demonstrated that such children can be helped to acquire appropriate schemata by teaching concepts and labels, elaborating, using questions to fill in conceptual gaps, and using imaginary play and storytelling.

In a study of metacognition and reading, Clark (1985) concluded that metacognitive abilities are useful in educational diagnosis and that strategies for students to monitor their comprehension and evaluate themselves should be taught as an integral part of a reading program in working with hearing students; this result would support the metacognitive findings of the study reported above by Martin and Jonas (1986) in which metacognitive discussion with deaf learners was also proven to be productive.

While several of the interventions cited were with older deaf students, it is equally important to focus on early intervention as well. Of course, the modality for intervention with the younger hearing-impaired (or hearing) learner would need to be more concrete, but the principles of intervention and mediation are equally important at the early age level. Many of the early childhood interventions appear to concentrate on early training in language and communication, and can only be considered to be cognitive interventions if they explicitly focus on cognitive strategies themselves and help students to consciously apply them to subject matter and other applications. Little has been done as yet in systematic intervention with deaf infants, and Nowell (1989) is correct in calling for the development of such techniques at this time.

To summarize, the most promising approaches to planned intervention appear to be those which have: (a) a strong theoretical basis, (b) a focus on teacher training or re-training in the specific methodology, (c) a comprehensive incorporation of several, rather than only a few, cognitive skills, (d) regular opportunities for students to apply these skills to subject matter, and (e) explicit metacognitive focus in terms of helping students to become aware of the cognitive processes and strategies which they are learning and applying. Clearly, additional research, particularly of a longitudinal nature, is needed. Greenberg and Kusché (in press) conclude that the reasoning and problem-solving literature indicates few differences between hearing and deaf children when mediation occurs through visual modes; the still small corpus of literature on this topic, they indicate, suggests that educational intervention is beneficial in making improvements in the reasoning and problem-solving abilities of deaf learners.

Conclusion

In looking both backward and forward in the fascinating area of cognitive development in the hearing-impaired learner, three concepts from the field of futurism are useful. Futurists make a distinction between the probable future, the possible future, and the preferable future. The probable future is one in which, with no specific or pro-active initiative, it is possible with high likelihood to predict what the future will hold. The possible future is that scenario which could happen with some perhaps unexpected circumstances, although it is not highly likely. And the preferable future is that scenario which will happen only if specific initiatives are taken to ensure it. What, then, would be the probable, possible, and preferable futures in regard to the cognitive development of the hearing-impaired learner?

We can perhaps quickly dispose of the possible future as one in which we can imagine some unlikely events. A possible future is one in which educators and researchers would return to the old conviction that deaf learners have lower potential than hearing learners, or that no further serious investigation is worth undertaking in regard to cognition and deafness. This possible future is likely only if some complete cut-off of support for research were coupled with a change in attitude back to that of the earlier times discussed in the historical section of this chapter. The writer is certain that no reader would hope for such a possible future.

A probable future--one in which, with little intervention, certain events will happen with high likelihood--would include the continuation of certain trends that have already begun. For example, it seems highly likely that the just-beginning interest in neuro-anatomy as applied to cognition and deafness will expand steadily; in addition, there will probably continue to be a focus on the interaction between language and thought, and we can also expect that the debate will persist about the primacy of one over the other as well as their interdependence. It is also probable that the gradual development of improved tools for assessment of the hearing-impaired learner's cognition will continue, with an emphasis on broader and more fair approaches to that assessment. And, it would appear that the continuing issue of American Sign Language versus other manually-coded systems of communication will be a source of debate, both in regard to the teaching of language itself, as well as to their respective relationships to the development of higher cognitive processes.

On the other hand, the preferable future is, of course, less likely without specific planning, initiative, and support (both human and financial). However, the preferable future is one toward which we should all strive. The preferable future, then, would include at least the following in regard to cognition and deafness:

1. Active support for each of the elements which were mentioned above under the probable future--in particular: serious investigations into modes of communication and cognition, neuro-anatomy and cognition, and assessment tools of a broader nature.
2. Incorporation of training in cognitive education within teacher education programs in deaf education.
3. Development and empirical testing of additional varieties of planned interventions in the classroom, and longitudinal studies to accompany them.
4. Greater emphasis and support for early intervention in cognitive development, including the preschool years.

5. Focus on the education of parents in terms of not only appropriate expectations of their deaf children but also appropriate interventions which they can do during the preschool years to promote higher-level thinking in their children, whether the parents are hearing or deaf.

6. Production by educational publishers of materials which will provide a greater cognitive challenge to the learner than at present.

7. Systematic education of employers and hearing colleagues of the deaf worker in the workplace in how to maintain high cognitive expectations (as well as adaptations) which are appropriate for the hearing-impaired person.

While it is tempting to declare that the preferable future is possible only with additional funding, such is not entirely the case. Although funding is a necessary condition, it is not a sufficient one; the sufficient condition is the continuing conviction, based now on clear evidence, that the hearing-impaired learner can indeed achieve the highest levels of cognitive performance, given the appropriate conditions and dedication by professionals. That challenge is the one to which educators and other professionals working with and on behalf of hearing-impaired persons must rise now.

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SOCIAL ASPECTS OF LITERACY ACQUISITION AND USE

By

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Introduction

In the recent movie, Stand and Deliver, the high school math teacher (played by Edward Olmos) succeeds in recruiting a gang leader's sidekick and body guard into his calculus study group in part by providing him with multiple copies of the textbook. Why?

So that his peers won't see him carrying books around.
In the early 1980s in cities around the U.S., older, preliterate Laotian refugees gladly picked up their notebooks and pencils and headed off to school daily, month after month, even though they had little expectation of gaining (or even needing) sufficient English literacy skills to handle by themselves the literacy demands of life in this country. Why? Because their hosts and host country expected them to study English, and because it was a social event -- as one man laughingly told us, like going to market!

Young high school dropouts living on the streets of a major urban city on the West Coast study in a concerted effort to get their GEDs. But when the instructor feels certain they are ready to take the test, they disappear, never to be heard from again. Why? Passing the test means opening the doors to new opportunities and maybe a more stable livelihood. But it also means leaving the street and their "family" of peers.

What do these people have in common, besides low level basic skills in English? They all have an awareness of the social context in which they function and a perception of the social values placed on literacy in that context. And their understanding of those social dimensions affects their behavior regarding their acquisition and use of literacy skills.

Literacy used to be thought of in one-dimensional terms: Either you knew how to read or you didn't. Gradually this perception gave way to an understanding of the existence of degrees of literacy, though the definition of how much was enough for a minimum standard was never clear. (See Levine, 1982, for a critical analysis of the history of the concept of "functional" literacy since World War II.) We still grapple with this question today. One of the major variations of it is: How much (and what) will one need to know to be a productive worker in the workplace of the year 2000 (or 2010)? What basic skills will be necessary to equip workers to meet the demands of new technology and changing roles within the workplace?

At least we are learning to recognize the importance of the context within which literacy is used, and about the functions or purposes of its use. As we shall see, this is a major step forward toward understanding why and how people learn (or don't learn) and toward designing more effective educational programs.

In the following pages I shall review the relatively recent development of the body of research which has brought out the significance of looking carefully at the social dimensions of literacy acquisition and use. I will then describe actual applications of this knowledge to the provision of improved literacy training for adults and young people.

One caveat is in order: I am not an expert on the hearing impaired, nor have I ever worked with deaf people. However, I am convinced that an understanding of the social context of the world of hearing impaired adolescents and their education is critical to any attempt to design effective programs to meet their literacy training needs and interests.

I hope to raise questions that you will be able to apply to your experience with these young people. Then together we can contribute informed recommendations for policy to create improved educational and training services for hearing impaired adolescents and young adults.

Significance of the Social Context of Literacy

The ethnography of communication. The focus on literacy as a social phenomenon rather than an individual characteristic has its roots in sociolinguistics.

As Szwed (1981) pointed out in 1977, this trend harks back to the work of Hymes (1962) on the ethnography of speaking. The concept of doing ethnographies of communication began to be applied to literacy in the 1970s, becoming a respectable research perspective in the 1980s with implications for educational practice.

Basso (1974) explored the ethnography of writing, building on Hymes' work, and in turn Szwed took this concept a step further to apply it to the ethnographic study of literacy. Others interested in bilingualism and multilingualism have looked at literacy (and biliteracy) (see Ferguson 1979; Fishman 1980; Spolsky 1981, 1983), further developing a sociolinguistic approach to the study of literacy.

Szwed raised some critical questions about our knowledge of what literacy is, looking particularly at what he termed "the social meaning of literacy." By that he meant:

> the roles these abilities (reading and writing) play in social life; the varieties of reading and writing available for choice; the contexts for their performance; and the manner in which they are interpreted and tested, not by experts, but by ordinary people in ordinary activities.

He noted the complexity of studying literacy through this type of lens -- identifying five elements of literacy: text (what is read and written), social context, function (why and under what circumstances reading and writing is done), participants (readers/writers), and motivation. Szwed cautioned that these elements are, of course, interrelated and affect each other, which led him to speculate on a variety of configurations of literacy -- differences between members of different ethnic groups, age groups, sexes, socioeconomic classes -- and individual differences depending on stage and position in life.

Szwed called for the need to conduct an ethnographic study of literacy in a community to explore these issues systematically with the purpose of understanding the phenomenon of literacy more fully and of identifying the community's educational needs in order to address them more adequately.

Literacy as cultural practice. During the 1970s studies of literacy in societies around the world were challenging traditional, school-related definitions of what it meant to be literate. They were finding that access to schooling did not necessarily correspond to use of literacy. Also, societies differed in their understanding of the benefits and functions of literacy. Some groups had writing systems but used them rarely. Literacy was not always considered a set of skills that all members of society should acquire.

One such study was that of Scribner and Cole (1978; 1981) among the Vai of Liberia. The Vai are of particular interest for the study of literacy because their tribe practices three distinct forms of literacy: (1) English literacy, acquired in school and used in certain sectors of society to hold jobs and obtain information; (2) Vai literacy, using a script created by the Vai themselves, learned outside of school and used for personal affairs and letter writing; and (3) Arabic literacy, acquired through religious training and used for reading the Koran.

The Vai example provides a case in which distinct literacies exist which are acquired in different ways and used for different purposes by different groups of people. One cannot speak simply of whether or not a Vai person is literate. The situation is far more complex. The work of Scribner and Cole suggested that literacy is a culturally organized system of skills and values learned in specific settings. Literacy practices vary from site to site, as do the participants in the practices, the nature and extent of the knowledge associated with the practice, and the language and script used. Thus it is essential to look at the literacy practice itself and the surrounding context rather than focus on individuals and their skills to understand when, how, why, and by whom literacy is used.

Literacy as a collaborative, social activity. Also during the 1970s, studies were examining literacy behaviors in communities in this country. Over nearly a 10-year period, Heath studied the communication of daily life in two working-class communities in the Southeast -- one predominantly black (which she called Trackton) and the other white (called Roadville). She and her colleagues studied the language use and recorded the literacy behaviors of individuals in various settings -- home, school, work and community. The result was a fascinating body of work (1980, 1982a, 1982b) culminating in the book Ways with Words (1983).

Relevant to the study of the social aspects of literacy, Heath found differences in the ways adults and children used literacy from one community to another. For example, in the black community adults viewed reading as a social activity, involving more than one reader. (In fact, Heath notes that solitary reading was viewed as an indication that the reader had not succeeded socially.) Readers in this community worked together to negotiate the meaning of written materials, discussing and joking about possible explanations. Reading was highly contextualized and purposeful. (Only relevant parts of instructions or brochures were read, for example, though the readers were capable of reading the entire material.)

Children from this community were not guided in their introduction to reading as are children in communities where parents are very school-oriented (though parents in this community highly valued school). Adults here did not read to their children or consciously model reading and writing behaviors. Rather, they let the children find their own reading and writing activities and adapted their instructions or assistance to fit the task chosen. Through this process the children achieved some mastery of the print around them without being formally taught and they were reading to learn, to acquire useful information, before they ever entered school to learn to read.

From this work, Heath drew the following conclusions about literacy skills and needs:

1. Reading and writing need not be taught exclusively in the schools. (In fact, formal methods of teaching and valuing literacy can limit potential for learning outside of school if community modes and competencies are devalued.)
2. Literacy acquisition does not require a tight linear order of instruction with isolated sequential hierarchies of skills.
3. Learners frequently possess and display skills out of school relevant to using literacy which are not exploited effectively for learning in school.
4. For a large percentage of the population, learning and sustaining reading and writing skills are not motivated primarily by a faith in their academic utility (Heath 1980).

What makes Heath's work particularly useful is the dual role she played, both carrying out an ethnography of communication which focused on child language and at the same time conducting teacher training to improve the schooling available to children in the area. The implications of Heath's work for improved access to literacy skills via schooling for culturally different groups will be discussed further below.

Another researcher who has shed considerable light on the social nature of literacy is Fingeret (1982, 1983a, 1983b, 1984). She conducted interviews and participant-observation fieldwork with illiterate adults (both Black and White) in a northeastern urban setting. She too discovered that literacy in the context of daily life is not an individual, solitary activity. Fingeret found an elaborate social network based on the exchange of skills and knowledge among readers and nonreaders. Getting help to read mail or contracts (as in the case of a nonliterate businessman) or write letters or fill out forms is an accepted everyday occurrence. Specific individuals are identified for their skills with certain items and/or the degree of confidence or trust one has established with them, and helping networks evolve which take on considerable social significance in the lives of the participants, nonreader and reader alike.

As Fingeret points out so eloquently in her work, illiterates are often fully contributing, integral members of their respective communities with common sense, abstract reasoning and problem-solving skills that they use in accomplishing activities in collaboration with others. They participate in elaborate social networks in which they receive the help they need to handle written materials in exchange for other types of expertise they possess (such as mechanical experience, counseling, or child care). Considering them to be powerless, unskilled, non-contributing members of society does them a crippling disservice and may complicate efforts designed to provide literacy training for them.

Sticht (1975; 1987; 1988) has done a considerable body of work identifying the basic skills training needs of the military and designing appropriate programs. He, too, recognizes the social nature of the uses of literacy, particularly in work settings. He and others (Mikulecky & Diehl 1980) have found great discrepancies in the difficulty levels of job reading materials and workers' reading levels, and yet through social interactions workers may use the materials productively to accomplish the work. Sticht is a strong proponent of the value of contextualizing literacy training to make it more effective.

A comparative study. My colleague Steve Reder and I have worked together in the study of literacy for the past 10 years. Steve had worked in Liberia with Scribner and Cole and was interested in pursuing further the concept of literacy as social practice. From 1978 through 1985 we conducted an ethnographic comparative study (funded by the National Institute of Education) on the development of literacy among adults in three ethnic American communities:

(1) an Eskimo fishing village in southcentral Alaska,

(2) a community of Hmong immigrants from the highlands of Laos now living on the West Coast of the U.S., and

(3) a partially migrant, partially settled Hispanic community in the migrant stream of the Pacific Northwest.

We were looking specifically at the effects of socio-cultural context on adult literacy development, trying to understand the many factors involved in whether or not adults acquire and use literacy (and different literacies) and what the implications of that understanding are for designing and implementing educational training for adults. (See Green & Reder 1986; Reder 1982, 1987; Reder & Green 1983, 1985).

Despite the many obvious differences among these three communities, they offer systematic features for comparison and contrast with regard to adult literacy development. All three share what we thought to be an important feature for adult literacy development: Each community has recently encountered rapidly increasing demands for literacy in everyday life. What makes the comparison of these communities useful is the fact that major differences exist among the socio-historical contexts in which these new environmental demands for literacy are being experienced.

Let me briefly sketch the history of literacy in each of these communities as a way of setting the stage for you to begin to picture what you need to consider when trying to identify the literacy needs and interests of a particular group or community. In Seal Bay, a pseudonym for the Eskimo village, contact with literacy has come as part of a broad, gradually increasing penetration of village life by the outside world (first by Russians in the early 19th century and later by the United States). Both the initial contact with writing and much of the subsequent development of literacy in this community has occurred without displacement from its traditional environment or economy. In recent years, a series of political and economic events has radically altered the relationships between the village and external governmental agencies as well as accelerating the transition of villagers from subsistence fishermen to commercial fishermen. These changes have placed new demands for literacy skills on adults in Seal Bay.

In Newton, a pseudonym for the immigrant Hmong community, the introduction and development of literacy has occurred in a dramatically different socio-historical context. Rather than being surrounded and increasingly penetrated by the literate, English speaking world as happened in Seal Bay, Hmong settlers in Newton were transplanted from their traditional environment and economy in Southeast Asia into radically different settings, fraught with incremental demands for new language and literacy skills. (The Hmong were by and large a preliterate group prior to moving to the United States.)

In Pleasantville, a pseudonym for the Hispanic community studied in the project, literacy development has taken place in a third and, in many ways, intermediate, context between those of Seal Bay and Newton. The community in Pleasantville is partially migrant (like the Hmong of Newton) and partially settled (like the Eskimo of Seal Bay). Some adults in the community encountered and developed literacy in a previous environment in Mexico, whereas others are becoming literate in a new language (English) in the new environment. Still others are of Hispanic descent but were born here and are literate in English, but not in Spanish. Economic roles in Pleasantville overlap partially with the traditional roles many community members held in Mexico.

Participant observation in each of these communities confirmed what Scribner and Cole (1981) found with the Vai in Liberia and Heath (1983) found in the two communities she studied in the southeastern United States: Literacy is manifested as a set of culturally patterned practices. Looking at literacy this way (rather than as an individual's skill level), we were able to ask a series of questions about the social organization of given literacy practices which led us to a better understanding of community members' literacy behaviors:

- What distinct social roles are evident among participants in a literacy practice?
- What are the social status and other characteristics of the individuals who fill those roles?
- What specialized knowledge (including but not limited to that pertaining to reading and writing) is associated with those roles?
- How are written materials used in the practice?
- What impact do various degrees of skill at working with those materials have on the performance of the practice?
- How is practice-specific knowledge socialized among participants?

Types of knowledge. We found, not surprisingly, that literacy is indeed a collaborative practice. Just as Heath and Fingeret have noted, people often work together on an activity requiring reading and writing. We also found that there are different modes of engagement in a literacy practice, and thus different types of knowledge about it held by the participants. We have discussed this more fully elsewhere (see Reder 1987; Reder & Green 1985). Here let me mention these modes of engagement and types of knowledge and then focus on one in particular.

One kind of knowledge necessary to a literacy practice can be called _technological knowledge_ of literacy -- that is, the requisite knowledge to be able to encode and decode written materials and to use the media required (paper, pencil, keyboard, for example). Another kind is _functional knowledge_ -- understanding how writing is used for social purposes and the impact of its use or nonuse on task outcomes. And a third kind of knowledge is an understanding of the _social meaning_ of a literacy practice.

Individuals may have varying degrees of these types of knowledge. Their engagement in literacy practices may depend on the type of knowledge they possess, and it may also help determine the type of knowledge they acquire (through continued engagement). For example, in Pleasantville a middle-aged migrant Hispanic man from Mexico who had taught himself the rudiments of Spanish literacy in his early 20s, and who could not speak or read and write in English, clearly understood the utility of a letter to the board of directors of a local social service agency. He asked me to help him formulate it, then he signed it and delivered it, registering his concerns about the services being provided to "his people." Without being technologically engaged in the literacy practice, he had enough functional knowledge to initiate the practice and carry it through.

This man gradually took on an advocacy role in the community, participating in other such literacy practices and expanding and sharing his functional knowledge. Over the years, as this man composed, signed and received more letters, both in Spanish and in English, his technological skills improved also, at least within the context of the letter genre. Similarly, younger people with better technological skills who participated under his guidance gained functional knowledge of the use of letters to request or demand services.

Social meaning. You may recall Szwed's use of the term social meaning (described above). The term derives from sociolinguistics, where it is applied to the choice of use of a particular language in a given situation based on the social implications of participants' recognition of one set of their multiple statuses over another (see Reder 1987). For example, in conducting fieldwork in Pleasantville, as an Anglo fluent in Spanish I knew that I had to be careful in initiating use of Spanish with Chicanos who were also bilingual (English and Spanish), particularly after getting teased by some (who were more comfortable in English) that my Spanish was better than theirs. As an ethnographer trying to understand the social dynamics of language and literacy use in this bilingual community, it was more appropriate for me to allow others to choose the language we would use. (This also gradually told me something about my acceptance in various circles within the community.)

We found the term social meaning especially useful in describing and understanding community members' choices of modes of engagement in literacy practices.

Let's take the example of the various social meanings of literacy in Seal Bay. The significance of multiple social meanings for literacy can be seen in the differing attitudes villagers have toward reading and writing in English and in Slavonic and how those attitudes have evolved. Literacy was first introduced through Russian Orthodox priests who established a missionary church. In that religious tradition, the reading of the Scripture, in Slavonic, is an essential part of the worship service. However, villagers still continued to speak the native Eskimo language. Native lay readers were trained in Slavonic and continued to read the sacred texts in a rote manner long after the missionaries had left and the villagers had lost the ability to actively comprehend the language. Literacy associated with Orthodox practice came to be regarded as "native" to the village and its readers were highly respected. The Orthodox church and its literacy practices -- largely restricted to reading for worship purposes -- are viewed today as a force for community solidarity and maintenance of the native culture.

When public education was introduced into this village by the U.S. government early in this century, however, literacy took on a second, different social meaning. Teachers encouraged full-time use of English, eventually leading to near extinction of the native language. The schools, the American government, and the new, English-based Baptist church all stressed the importance of active use of English writing for a whole new range of literacy practices, including conducting village business. English, and especially English reading and writing, came to be associated with forces that were destructive to native tradition. The influence of these negative associations can still be seen today. Even though English literacy has gradually pervaded many aspects of community life and villagers do make use of it for the benefit of themselves and the village, they continue to prefer to conduct much of their business orally and are extremely reticent to display their English literacy skills, especially in front of non-native outsiders. Adult literacy programs have tended to attract few in this village for this reason.

On the other hand, the Hmong (as noted in the Introduction) have developed very positive social meanings associated with English literacy. And Hispanics in Pleasantville have differing meanings, depending in large part on their past experiences with schooling. For recent immigrants from Mexico, English literacy is viewed very positively. They are pleased with the education their children are receiving here and they have high hopes for the advantages that education will bring them. In addition, for those who have received legal status through the recent Amnesty legislation, studying English (and English literacy) has taken on new meaning because it is a requirement for continued legal residence here. For some Hispanics born in this country, however, English literacy represents their unpleasant experiences with formal schooling. Consequently, the negative social meanings they attach to it affect their participation in activities requiring reading and writing.

Studies of the Early Childhood Context of Literacy Acquisition and Use

The literature is replete with in depth, observational studies of the social context of literacy acquisition by young children, particularly as readiness for literacy relates to uses of spoken language. While preschoolers are not our focus here, much can be understood about the state of an adolescent's literacy development by considering the early contexts for learning that he or she experienced. I mention only a few of these studies here. Perhaps one of the most useful collections on this early environment is the anthology Awakening to Literacy, edited by Goelman, Oberg and Smith (1984). It is the result of a symposium in 1982 which brought together anthropologists, linguists, psychologists, sociologists and educators to discuss preschool children and literacy. The many insightful studies reported there are too numerous to describe here, but this book is highly recommended reading for anyone interested in a rich and detailed view of the early stages of literacy acquisition among children.

In her final discussion of the meaning of the symposium, Oberg notes that it is clear that certain features of the cultural context within which a child becomes literate have some relation to the degree and quality of literacy attained. But she cautions that the family context is probably the most reliable unit of literacy transmission, reminding us that a child's literacy or lack of it cannot necessarily be linked to cultural group, social class or ethnic background. She goes on to emphasize the importance of context and function in the acquisition of literacy by noting a fundamental difference between family and school contexts: In the family context most literacy learning occurs incidentally and in relation to purposeful acts. In contrast, most literacy learning in school lacks the purposefulness and contextualization characteristic of literacy learning in the family.

Others, such as Heath (cited above), Taylor (1983), Teale and Sulzby (1987), and Wells (1985), have pointed out the importance of the home context and the value of participating in relevant, meaningful uses of literacy as preparation for becoming a reader. Similar to our findings regarding the various modes of engagement in literacy by adults and the ways that involvement can influence the spontaneous acquisition of skills and knowledge, so too does participation in functional, everyday uses of literacy facilitate learning to read and write for small children.

Social Contexts of Adolescent Literacy

Interestingly enough, there have been fewer in depth, field-based studies of the social contexts in which adolescents use reading and writing and increase their skills and knowledge. To be sure, there is an enormous body of literature about the problems of youth at risk of dropping out and appropriate programs to meet their needs.

But ethnographic studies of adolescent literacy are relatively rare.

Our interest in adult literacy issues led us to consider the social organization of literacy among adolescent dropouts, particularly those living on their own on the streets of major metropolitan areas in this country. In 1985, Conklin and Hurtig (1986), also colleagues at Northwest Regional Educational Laboratory, conducted a study of the causes and scope of school dropout and, in particularly, the contexts for literacy use and need for further training of street youth in a major metropolitan center on West Coast. The study, funded by the U.S. Department of Education, found that understanding the social nature of literacy practices was particularly germane to describing street youths' lives and their perceived basic skills needs and interests.

The use of literacy by street youth is very often a social activity. Much as Heath described adults in Trackton interacting as a group when dealing with written materials, street youth joke and tease and interpret the meaning of magazine articles, want ads, crossword puzzles, assistance forms. They work on things together, some contributing bits of functional knowledge about the item and the consequences of its use, others with good technological literacy skills actually filling it out or reading it aloud.

Conklin and Hurtig found that reading and writing are important activities for street youth. When initially asked about literacy, most youth answered that they didn't need reading and writing for their lives. Upon further exploration, however, this type of response turned out to refer to reading and writing that they associate with school. Based on youths' specific reflections on their daily lives and on participant observation, the study found widespread use of both reading and writing. Like most teenagers, street youth are avid consumers of and devour advertisements, magazines and newspapers, record jackets, posters, etc. They also write a great deal -- for personal correspondence and personal expression. When a local social service agency sponsored a writing contest for these youth, the response was overwhelming and the results were both moving and impressive.

Youth on the streets have a wide range of literacy skills and knowledge. Just as is true of other dropouts, not all of these young people have low level basic skills. Still, writing samples from 80 applicants for services, at two agencies serving street youth, showed that 44 percent had poor or marginal writing skills and would have difficulty filling out applications for services or employment.

Street youth don't easily admit that their reading and writing skills are insufficient for their present lives. Instead they tend to assert that they don't need any skills they don't already have. Here we see the role of social meanings of literacy come into play in a powerful way. As Conklin and Hurtig (1986:51) point out, literacy is not socially neutral for these youth, but rather very heavily value laden. The social significance of literacy that ties reading and writing skills to achievement, success and acceptability in the straight world makes it impossible for street youth to overtly value educational training. "Literacy represents a struggle they are waging between the values of their marginal life-style and the values of the culture they have left; their attitudes about literacy directly reflect this internal conflict."

Nevertheless, most youth write often for their own purposes. As other studies of teenagers have shown (see Shuman 1983, 1986 below), writing notes to each other, writing personal diaries and writing poetry are common genres of expression. The following writing sample illustrates both the social consciousness of the writer and her understanding of the social acceptability of the use of writing (however imperfect in technology) to get this message to her peers. It was submitted by an 18-year-old dropout from seventh grade to a counselor at a youth-serving agency to be posted on the public bulletin board.

The Reality of Life

> I have experienced some very real things in life and I feel that know one person should have to go through lifes hard core punishments so who ever reads this I want you to know that your not alone. I myself and others have some way been involved in either family problems or life on the streets. I am 18 years old and I have been living this day by day life for 7 years I think I have some of the same feelings as anyone else that has lived a disturbed life I know everyone is different but we still need to stop are problems before its just to late. So If you feel like your problems are just moving out of hand search for help or at least find someone to share your mixed up feelings with I'm real sure It would be better than carrying around a bunch of problems that you really don't need. I'm for real about what I am saying and I myself am real It took a long time but I am. And so are you so please don't let it end before you give it a chance.

Most studies examine adolescent literacy in the context of its relationship with oral language. This dual focus reflects not only the high degree of orality in adolescents' lives, but also the inevitable interrelationship between spoken and written language in daily life in general. Labov (1972) spent years studying oral and literate language behavior among black youth in Harlem. In a striking example of how differing groups associate different social meanings with literacy, Labov and Robins (1969) describe how success on the streets correlates inversely with educational achievement. In their study of youth gangs they found that the more stature a boy had on the streets, the lower his reading achievement level. All central and leading members of youth gangs were reading well below grade level, yet they exhibited strong verbal ability and exercised decision-making skills that their followers relied upon for their very lives. Labov and Robins conclude that "...the major problem responsible for reading failure is cultural conflict. The school environment and school values are plainly not influencing the boys firmly grounded in street culture" (1969:56, cited in Conklin & Hurtig 1986:50-51).

Similar findings are reported by McDermott (1974) in his study of minority dropouts. He notes that school failure is considered an "achievement." Minority youth achieved status by being rejected by the school, which represented the White, "straight" world which routinely rejected them in other aspects of their lives. This is similar to the feelings experienced by the predominantly white street youth studied by Conklin and Hurtig, who, having been abused and discarded by family, school and "straight" community, in turn reject that mainstream world and its values, even when (as in the case of getting a GED -- or the very fact of living on the streets!) such rejection may be detrimental to their well-being.

Shuman (1983, 1986) spent 2-1/2 years studying oral and written language use by urban adolescents in a multiethnic inner-city junior high school in the eastern United States. Her work is particularly relevant to our focus on the social aspects of literacy because of her analysis of the functions of oral and written texts in the daily life of these teenagers and the effect of oral language on literacy practices. As Shuman notes, an unfortunate consequence of the common polarization of writing and speaking studies is the tendency to equate writing with standardized texts and therefore exclude the very meaningful uses of literacy in daily life. Shuman takes a much broader view and provides a case study rich in language and literacy samples from these young people's lives.

Shuman looked at the context of literacy use on three different levels: (1) the cultural context, that is, the general social structure of a community and its bearing on the uses of and attitudes toward literacy; (2) the situational context, the relationship between participants engaged in communication in a situation involving oral or written language; and (3) the more specific level of communication strategies or conventions -- whether or not speaking and writing constitute different relationships between text and context.

In the community Shuman described, all the parents of the adolescents studied claimed they knew how to read and write, but did so only infrequently. Shuman found that the adolescents used their literacy skills more often and for more varied purposes than their parents. In fact, they were often the family reader, writer and translator. As Conklin and Hurtig found with street youth, Shuman notes the high degree of collaborative literacy practiced by these young people, whether as equal participants with their peers, or in more hierarchical relationships, as when reading or writing something for their parents. We also found this to be true among both Hispanic and Hmong immigrant adolescents.

In the many notes teenagers wrote to each other, their personal diaries, and even a petition to the principal, Shuman found that these youths wrote as they spoke. Literacy did not necessarily produce certain kinds of text. Their use of writing was based on the daily contexts of their reading experiences -- helping the family or interacting with their friends. Thus, their writing was never context-free, but always written with the assumption of the broader understanding of the potential readers and of the group process the reading of it would entail.

Meek and her colleagues (1983) bring a somewhat different perspective to the study of adolescent literacy. They are teachers who carefully documented their work over time with adolescent non-readers in a school in London. This work includes excerpts from their interactions with their students, samples of students' writing, dialogues with students about literacy in their lives.

This work reflects the teachers' frustration with dealing with another example of the power of the social meaning of literacy: the reader or writer's diminished view of his or her own skills.

In the adult world, many people with relatively low basic skills have been socialized to accept society's judgment of them. The reluctance of many adult learners to let anyone in their community know they are studying to improve illustrates the degree to which illiteracy has been viewed as pathological in this society. Similarly, many adults are ashamed and consequently do not attempt to gain better skills.

Adolescents are very well aware of such societal views. In addition, if they are still in school they are participating in a social situation daily which rewards and punishes them based on individual skill levels. Many adolescents with low skills come to view themselves negatively and that view is reinforced all too often by teachers whose expectations for student progress and performance correlate with the skill levels of their students. That is, they expect more of the better students and even use different teaching techniques.

Children know how their teachers view them. Meek and her colleagues (1983) have written eloquently of their adolescent students' struggles with learning to read and write and what they as teachers learned working with them. At one point they refer to the students as having been "in captivity" -- kept there by their previous teachers' socially sanctioned views of them and their low reading skills. Meek and her colleagues note how low readers are often given worksheets with minimum reading and writing requirements in lieu of the more complete reading and writing tasks assigned to better students. The students know the difference, and "the circle of failure revolves again" (p. 219).

According to Meek and her colleagues, the real condition of concern with their students was not the lack of desire to learn, or even poor basic skills, but rather it was the students' absolute conviction that they could not be successful no matter what they did.

Applications

What has this brief exploration of multiple social contexts of literacy acquisition and use shown us? In particular, what have we learned that can be applied to working with adolescents with low basic skills to help them improve their literacy skills, knowledge and interest in using written materials?

We have seen that literacy is a set of socially structured practices. There are several components to knowledge of literacy, including technological knowledge, functional knowledge and knowledge of the social meanings of literacy acquisition and use. These types of knowledge may be acquired in different ways, by different sectors of a society, and individuals may acquire one type without another. Similarly, they may use one type and not another (what we have called different modes of engagement). Because of its social nature, literacy use is often a collaborative venture. Literacy does not have to be acquired in formal training;

spontaneous acquisition is commonplace, dependent on the relevance and purposefulness of the practice for individuals' daily lives. Literacy is not limited to formal, structured texts, but rather is often closely linked to spoken language. And individuals and communities attach multiple and complex social meanings to the acquisition and use of literacy.

These characteristics of literacy must be considered when designing programs to serve adolescents' needs for improved basic skills. Let's look at some applications of these concepts to practice.

As noted earlier, Heath's dual role as ethnographer and teacher trainer put her in a unique position to apply her findings. Referring to the black community of Trackton, Heath (1980) describes how one teacher avoided the typical reading program trap of slowing down instruction and breaking skills into isolated fragments out of context. Instead, this teacher built on what she knew was going on in her students' lives at home and brought her students' perceptions into the classroom to aid her instruction. Heath (1980:130) cites the teacher's philosophy:

> Reading and writing are things you do all the time -- at home, on the bus, riding your bike, at the barber shop. You can read, and you do everyday before you ever come to school. You can also play baseball. Reading and writing are like baseball or football. You play baseball and football at home, at the park, wherever you want to, but when you come to school or go to a summer program at the Neighborhood Center, you get help on techniques, the gloves to buy, the way to throw, and the way to slide. School does that for reading and writing. We all read and write a lot of the time, lots of places. School isn't much different except that here we work on techniques, and we practice a lot -- under a coach. I'm the coach.

Heath (1982a) describes how teacher training programs and teachers in daily practice need to be able to tap into the uses of language (and literacy) and the ways of "talking about things" of their culturally different constituents and build on those skills in the classroom. In this way she notes that schooling will no longer be a one-way path from school out to community, but will become a more effective two-way communication of knowledge which no longer excludes certain groups.

Heath (1981) applied this strategy to the teaching of writing with black and white junior and senior high school boys with third to fifth grade reading abilities. Writing instruction began with bulletin board messages and advertisements and expanded to include discussions of students' perceptions about reading and writing problems in their environment outside of school. Eventually, students were analyzing and rewriting social service memos, housing regulations, warranties and other legal documents to clarify their meaning. The relevance of the instruction for the lives of these youths had brought improved writing skills within their grasp.

After Conklin and Hurtig completed their study of the basic skills training needs and interests of street youth, we obtained funding to apply our ideas to the design of specialized training for them (see Wikelund 1989 and Wikelund and Conklin 1989). Funded by a local private foundation (The Fred Meyer Charitable Trust), the project designed training for volunteer tutors to work directly with street youth at the social service agencies where the youth had already made contacts and felt comfortable. Called Takin' It to the Streets, a name given the project by the youth themselves, the design of the tutorial approach grew out of our understanding of the social context of literacy specific to street youth. Our approach was based on the following premises:

- Training should take place at the youth social service agencies where street youth feel comfortable.
- Volunteer tutors should be specially trained to work with street youth, receiving concentrated training on the culture of street life.
- Training must be learner-centered to meet the needs, interests, skill levels and pace of each individual youth. (Training should start with whatever the youth are interested in and proceed from there.)
- Training should be focused on functional, real-world tasks and materials that are relevant to these youths' lives.
- Training should identify and build on learner's strengths (drawing out the functional knowledge abut literacy practices that all youth have).
- Training should not be limited to one specific method or set of materials because every learner is different. A wide range of materials and methods may be useful.
- Evaluation of the training should focus on the process of interacting and the overall learning and reengagement in learning that the youths experience, rather than on the successful achievement of particular goals. (Success has many definitions.)

We have also applied our perspective of the significance of the social context of literacy to the design of volunteer recruitment and tutor training strategies for work with adults (see Green, Reder & Conklin 1985; and Reder & Green 1985). As noted earlier, most adults (and adolescents as well) with low level skills have developed social networks that provide them with the assistance they need to accomplish the literacy tasks in their daily lives.

Through our observations of the lives of these adults, we became aware of the important role that informal literacy helpers play. We feel that these literacy helping networks may be an appropriate point for intervention to help individuals who want to improve their basic skills, but who might otherwise never participate in a formal instructional program.

Classroom-based literacy training and adult education rarely build on the social nature of literacy practice in the real world. Instead, formal teaching programs separate illiterates from the social environments which afford them a sense of identity and worth and place them in classrooms where they are expected to solve problems as individuals. Even in home tutoring, the dynamics of being tutored by a stranger evoke formal instruction expectations and anxieties. We believe that literacy training providers can expand their services by recognizing the value of the elaborate social structure that forms the fabric of daily life for illiterate adults.

Luttrell and Fingeret (1985) have also taken the research of Fingeret into application. They have designed a resource guide for teaching adults who are learning to read by building on the collaborative nature of literacy. The guide helps tutors and teachers work with their students to adapt and create materials that reflect the specific issues, concerns and experiences of their learners. The guide is a concrete example of how reading selections can be created from adult students' own words. The guide encourages participatory learning, with group readings and discussions.

Finally, Davidson and Koppenhaver (1988) traveled around the country visiting programs effectively providing literacy training for early adolescents. Their report presents in case study format valuable examples of how best to work with young adolescents who have low level basic skills. In summing up what works, they note that fundamental to success with this population is dealing with the whole child. Good literacy programs must also be good adolescent programs; that is, they must integrate effective instruction in a format that has been tailor-made for the characteristics and needs of young adolescents. Such programs have high expectations -- the staff believe that the students can and will learn. The programs are also developmentally responsive. They address issues of poor self-esteem, anger, depression, self-destructive behavior because these problems often accompany reading failure in young teens. Among the various curriculum and instruction characteristics outlined in the report, many are directly in keeping with the approaches outlined above:

- spend a high proportion of time actually reading and writing and discussing what is read or written;
- teach skills in context;
- build on background information and experience;
- integrate speaking and listening with reading and writing;
- use involvement-based curricula (doing rather than drilling);
- provide a wide variety of materials; and
- value collaborative learning, using varied groupings.

Implications

My charge today has been to share with you some of the latest research on the social aspects of literacy acquisition and use. You know, far better than I, that hearing impaired adolescents bring with them special characteristics to be considered in the design of programs to meet their needs. As a focus for the work group of this session, I would like to take a few moments to raise some questions to start us thinking about an ethnography of literacy for hearing impaired adolescents. This will then help us determine the information we need to gather to be able to provide appropriate and effective literacy training for these young people.

Let me begin by acknowledging my awareness of the existence of my own hearing bias. As Lane (1988) has warned in his critique of the concept of a "psychology of the Deaf":

> Hearing experts, commonly ignorant of the language, institutions, culture, history, mores, and experiences of deaf people, could only be guided in the first instance by the stereotypes to which we have all been acculturated."

Several researchers (perhaps most notably Reagan, 1985, 1988) have noted the similarities between the deaf community and other cultural and linguistic minority groups. Considering some of the parallels that suggest themselves helps us to begin to examine carefully the specific needs of low-level literates in this population.

- How is membership in this group defined?
- Is there a language common to members of the group?

- How is knowledge of the language acquired and passed on?
- Are there specialized roles related to that knowledge?
- What functions does the language serve?
- Does the language have a written form?
- If not, are members of the community literate in another language?
- If community members are fluent in more than one language, what is the relationship between/among languages? and among users of the different languages?
- How is the ability to read and write acquired? and in what settings?
- What are the accepted methods of instruction and of learning both in and out of school?
- How is the ability to read and write distributed in the community? Does this distribution vary with characteristics such as age, sex, socioeconomic status, educational level?
- What functions does the written language serve?
- Do its uses vary by context of use? by participants (users)?
- What kinds of information are considered appropriate for transmission through written channels, and how, if at all, does this information differ from that which is passed through alternative channels such as speech (or sign)?
- Who sends written messages to whom, when, and for what reasons?
- Is the ability to read and write a prerequisite for achieving certain social statuses?

I look forward to joining you in exploring the answers to these and other questions as we attempt to define policy recommendations that will address the needs of hearing impaired adolescents for improved literacy training.

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ADULT LITERACY, COMPUTER TECHNOLOGY, AND THE HEARING IMPAIRED

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ABSTRACT

Research shows that computer-assisted instruction can assist the hearing impaired adult learn basic literacy skills. Unfortunately, although computer technology is advancing rapidly, software development for teaching literacy skills to the hearing impaired adult is in its infancy. While there are a few programs available for this purpose, they have not been rigorously evaluated for effectiveness and appropriateness. Recommendations include: 1) further research and development, building on current research in adult literacy and applying it to the hearing impaired population; 2) careful evaluation of the effectiveness of pilot projects; 3) teacher training and technical assistance in computer technology; and 4) communication with ongoing projects and organizations across the country to share information.

INTRODUCTION

We would like to consider today how technology, especially computer-assisted instruction (CAI), can assist the hearing impaired (HI) adult in learning basic literacy skills. Three topics will be explored to provide background for this discussion. First, adult literacy research, in general, addresses many issues of concern for the HI population. Second, the literacy needs and skills of the HI population specifically must be considered. And third, the use of technology in adult literacy programs in general will give direction to the question at hand. The review of literature in these areas provide only a brief summary of some of the research and should not be considered comprehensive. [See

Appendix for a more extensive overview of Adult Literacy.]

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Adult Literacy

National Impact of Illiteracy

Illiteracy is an issue of critical national and international concern. The statistics are alarming; as many as 27 million adults in this country are unable to participate fully in our democratic, social, and economic systems because of illiteracy (Harman, 1985, 1987). An additional 2.3 million persons are added to this group each year through immigrants and high school dropouts (McCune and Alamprese, 1985). Illiteracy affects many aspects of our lives; however, two issues are of special concern: the effect of illiteracy on our economy and its inter-generational effect on families. Lost productivity is one of the most generally recognized cost of basic skills deficiency. In 1986 the United States Congress, Office of Technology Assessment reported that lack of basic skills in the workforce "may manifest itself in sluggish productivity growth, increased needs for supervision, and deficient product quality. These costs are difficult to quantify but are probably substantial" (Collino, Aderman, & Askov, 1988, p.13).

Additionally illiteracy is often inter-generational; low-literate adults are unable to promote essential pre-reading skills in their young children (Kirsch & Jungeblut, 1986; Thompson, 1985; Segalman, 1981). Less educated homes offer fewer opportunities for the preschool child to observe role models performing reading tasks and to listen to extended, elaborated spoken discourse like that found in the schools (Anderson, Hiebert, Scott, Wilkinson, 1984; Sticht, 1987). Even more important is the impact of illiteracy upon the quality of life for those individuals. A functionally illiterate person cannot participate fully in society and make independent decisions as a worker, citizen, parent, and consumer. Although illiteracy cuts across all socioeconomic groups, the poor and racial and ethnic minorities are most often affected.

Functional Literacy

Literacy in its simplest definition, is the ability to read and write. Definitions of functional literacy, however, address the more complex issues relating to the ability to complete tasks as defined by the environment. Harman (1985) for example, defines functional literacy as including not only the ability to read and write but also the possession of knowledge and skills which enable an individual to function effectively in his/her environment. An individual's interest and participation in literacy programs is determined most often by the person's immediate needs and interests, such as getting a job or helping a child with homework. In other words, a person must perceive literacy as personally useful. Once integrated into the person's life, literacy skills can become effective tools in coping with daily concerns in the home, community, and workplace.

Various studies have measured the functional literacy levels of adult populations. The 1985 National Assessment of Educational Progress (NAEP) study concludes that most of America's young adults between the ages of 21 and 25 can read and understand the printed word. Unfortunately, many of these same adults are unable to perform well on literacy tasks of moderate and more challenging complexity. This is a disturbing conclusion considering the increasing complexity of modern society. Kirsch and Jungeblut (1986) and Venezky, Kaestle, and Sum (1987) report that within the next decade the young adult population will be composed of increasing proportions of minorities and those who have completed less than twelve years of school--many of whom will be seriously lacking in complex literacy skills.

As interest in adult literacy has grown, concern about how best to meet the needs of the low- literate adult through appropriate teaching methods and curriculum materials has also grown. This concern is reflected in questions such as: What basic skills should be taught? How should they be taught? What approaches are effective? How do we meet the information needs of adults? How can we help adults see the usefulness of literacy?

Communication and Thinking Skills

Although reading, writing, and math have been generally recognized as the three basic skills, recent research indicates that thinking is a fourth basic skill and possibly is the most important (Goudreau, 1986; Presseisen, 1986). We are concerned today with the basic skills of reading, writing and thinking which are essential for effective communication.

Proficient, independent readers are those who are able to recognize many words quickly without having to analyze them (word recognition skill). They are also able to understand the meanings of those words when seen either in isolation or in the context of a written passage (comprehension skill). As reading tasks become more complex, the proficient reader is able to use additional strategies (thinking skills) in order to evaluate, integrate, and assimilate newly learned information. Presseisen cites four types of complex thinking processes: problem solving, decision making, critical thinking, and creative thinking. While one could argue that other skills might be included, these most fundamental processes should be applied in various relevant content areas. In the case of the adult student, application in daily living and in the workplace is of critical importance.

In addition to relevance and applicability, adult instruction should include the development of metacognitive skills. Students become confident in their abilities to solve problems and find answers, because they have learned to think through problem solving situations. Development of metacognitive thinking skills can be taught directly, according to most researchers, and most effectively within the context of learning new content.

Reading and writing, the fundamental basic skills building blocks, are integrated and reinforced through communication and thinking skills instruction. The ability to think critically and to communicate effectively are essential if adults are to participate more fully in community activities and in the civic processes fundamental to a democratic society.

Whole Language Approach

Since many adult beginning readers have difficulty in moving beyond simple word recognition skills to the more complex skills involved in comprehension and problem-solving (Chall, 1984), it seems obvious that programs must be developed which will enable low-literate adults to improve the complex skills of reading comprehension, writing and critical thinking skills. It is important that critical thinking be taught through the combined use of all types of communication--listening, speaking (signing), reading, and writing--in other words, a whole-language approach (Goudreau (1986; Presseisen, 1986). These critical thinking skills are the same skills needed for success in the workplace. In fact, Askov and Otto (1985) conclude that reading and writing are parallel ways of processing written language and also parallel the creative thought process. Instructional approaches, therefore, which teach reading and writing together provide a natural setting in which to teach other complex skills. This approach allows instructors to build on the strong relationship that exists between reading and writing (Goodman and Goodman, 1981; Rubin and Hansen, 1985).

Process Approach to Writing

One way to integrate reading, writing and critical thinking is through the process approach to writing. The process approach to teaching writing is effective with children in improving their reading and writing (Applebee, Lehr, and Auten, 1981; Graves, 1983;

Howard and Barton, 1986; Kean, 1983; Murray, 1984; Myers, 1984). In the process approach, teaching focuses on the process of developing writing rather than on the product. Students are guided through the steps of rewriting (brainstorming ideas), learning appropriate vocabulary, composing the writing sample concentrating on content rather than mechanics (spelling, punctuation), sharing the writing with other students to generate ideas for revisions., editing the writing focusing on mechanics and clarity, and, finally, publishing the final writing.

This method has not been widely used with low literate adults. The Institute for the Study of Adult Literacy, however, is currently adapting the process approach for adults. The process is being used with older displaced workers and trained tutors who use a word processor to produce student generated writing. The writing samples are shared with other student/tutor pairs via computer discs. Although further research is needed, it appears that an instructional approach that teaches basic skills in an integrated way and with meaningful content is most effective method of teaching adults.

Functional Context Instruction

The concept of functional context instruction (Sticht, 1987) has made an important contribution to adult reading instruction. Basic skills that are essential to performing a job are identified and then taught within the functional context of the job so that the adult not only learns the basic skills that are important to performing the job well but also masters the content knowledge associated with the job. Job-related basic skills instruction has been proven to be more effective in enhancing productivity on the job than general basic skills instruction offered by commercial materials (Sticht, 1987). Although Sticht's research is based on workplace settings, the same approach can be used effectively in other environments where relevant content serves as the context for instruction in basic skills. For example, parents may practice English communication skills in the functional context of learning strategies for improving their children's success in school.

Adult Literacy and the Hearing Impaired

Need for Improved Literacy Levels for HI Adults

The definitions of functional literacy when applied to special needs populations must take into consideration the unique characteristics of the special population. Today, of course, we are focusing on the special needs of HI adults. A person with a hearing loss is placed under considerable strain to cope with a culture in which the primary mode of communication is through spoken language. Psychologically, the hearing impaired individual must cope with the frustrations of trying to communicate and understand what the outside world is trying to convey (Hewitt, 1978). In addition to the psychological barriers, rapid changes in modern technology have increased the need for more literate individuals. HI adults are forced to have higher levels of literacy than ever before to cope successfully with modern society. Early in this century only a minimal level of literacy was expected of most people; however, Jean Chall (1984) estimates that a minimum literacy level of twelfth grade is needed to cope effectively with the literacy expectations of today's society. In view of rising literacy demands, it is increasingly important for low-literate HI adults to acquire both basic and more complex English literacy skills in order to become active, contributing participants of society.

Characteristics of HI Adults

Adults with disabilities have most of the same behaviors, attitudes and perceptions pertaining to learning as any other group of adult learners, according to Dr. Mary Carter-Williams (1988), Director of Continuing Education at Howard University School of Communications. "But they bring many different learning styles and experiences, so that no general model is applicable to all those with disabilities. Some may have had previous experiences that were not positive, and they face emotional factors such as anxiety, fear and general barriers" (p. 4).

Dequin & Johns (1986), emphasizes that for both learning and entertainment, visual media are best in helping the hearing impaired learn. When dealing with HI adults we must consider two important factors: 1) the HI adult has had a variety of life experiences on which to build, and 2) the HI adult, who cannot read or write, has had a variety of negative experiences of failure to learn in the traditional way at the usual time. HI adults usually lack the normal language experiences of hearing individuals which, in turn, limits their life experiences.

Joan Ehrlich (1988), former coordinator of Adult Basic

Education at Gallaudet University, reiterates this belief by stating that deaf adults can be different and have unique characteristics; but, in some ways, they are the same as all adult learners. She also describes: factors affecting how a person with hearing loss will learn, including whether the family is hearing; how the family reacts to the person's deafness; whether it is accepting or has a problem with the hearing loss; whether the person has attended a public school or special school and learns sign language; and whether the person was born with the ability to hear, later losing the ability to hear or was born deaf, indicating a different type of development (p. 10).

Language Development

Hearing children's experiences with oral speech and an oral culture allow them to develop a conceptual knowledge of word meaning and linguistic style enhances reading development (Webster, 1986). "The typical...hearing child brings to the reading task a rich background of experiential, cognitive, and linguistic skills. These pre-reading skills and knowledge provide the base for the development of reading (King and Quigley, 1985).

The child with a hearing disability will not develop linguistically in the same manner as the normal hearing child. If the hearing loss is severe, the child risks greater deprivation in areas of emotional, social and educational development. "Since reading ability is highly correlated with prior English knowledge, many students who are deaf...have difficulty becoming proficient readers" (Commission on Education of the Deaf, 1988).

King and Quigley (1985) describe the problems related to teaching reading to hearing impaired children. "The typical deaf child lacks [a rich background of experiential, cognitive, and linguistic skills]. It follows from this alone that the deaf child will have great difficulty learning to read and that the reading process will be entangled with the basic primary language-learning process and with the cognitive and experiential deficits of the deaf child." Webster (1986), asserts that deafness is not just a deprivation of sound but a deprivation of language, and that difficulties in language development and reading skills follow hearing impaired children through the high school years into adulthood. Since the Commission on Education of the Deaf (1988) suggested that "95 percent of [deaf individuals] are deaf at birth or lose their hearing before they have acquired English or other spoken language skills," it is not surprising that pre-lingually deaf adults have about a third grade reading level (Trybus, R. J. & Karchmer, M. A., 1977).

ASL and ESL

Because reading and writing are based on the need to communicate with an already learned spoken language the HI adult doesn't have this motivation. However, the HI adult does have a language which is rich in expression and emotion. A gesture or sign can have many meanings, determined by the expression on the face, the speed of delivery, and location in relation to the body. Lacking experience in hearing the spoken word, communication skills develop along other lines.

Many of the deaf use American Sign Language (ASL). ASL is often the first language to which hearing-impaired adults are exposed. Although ASL is as complex and expressive as English, there are distinct differences in syntax, grammar, and vocabulary; ASL, therefore, cannot be easily translated into written English in the way that hearing individuals read and understand it (Commission on Education of the Deaf, 1988). As a result, children and adults who use ASL are confronted with learning English as a Second Language (ESL) when they enter school.

Research into first language (L1) acquisition shows that children develop competence first in listening and then in speaking before they are prepared for exposure to formal instruction in reading and writing (Prewitt-Diaz, 1985; Sticht, 1987). The development of these competencies in oral language are critical to the development of competence in written language. Recent studies in second language (L2) acquisition also conclude that developing listening comprehension skills in the second language is critical to the development of oral proficiency and literacy (reading and writing) skills in that language (Potovsky, 1981; Winitz, 1981; Dunkel, 1986). Some instructional methods, such as English as a Second Language, High Intensity Language Training, Sheltered English, and Structured Immersion, use only English to teach language skills.

It is obvious then that learning English as a second language depends largely in listening proficiency. HI adults obviously cannot benefit from instruction that focuses on listening to

English. Perhaps a more successful approach will be a bilingual instructional approach.

Bilingual Instruction

Bilingual instruction incorporates the first language, in this case ASL, into English language instruction. Instructional methods may stress the development of English skills or the development of both English and the native language. Bilingual instruction teaches English using the student's native language skills to develop English language skills. These programs depend in part on identifying specific reading and writing skills common to both languages and those skills unique to each language. The instructor teaches and reinforces skills in the native language and prepares students to transfer skills acquired in the native language to English (Prewitt-Diaz, 1985). Obviously one of the problems in using this approach with HI adults is its dependence on using reading and writing skills in both languages, and ASL is not a written language.

In developing appropriate instructional methods it is important to remember that 1) HI adults are adults, regardless of their special learning needs; 2) deafness, especially pre-lingual deafness seriously affects HI adults' ability to learn English reading/writing skills; and 3) HI adults whose first language is ASL must learn English as a second language.

Benefits of Literacy Programs for HI Adults

Gallaudet Adult Basic Education programs and others are being innovative in developing literacy programs for HI adults. HI adults benefit from literacy programs in the same ways that all education programs and services assist their participants (Gallaudet, 1987). They may increase their level of functioning, by being able to read better, or understand more. They may also benefit by increasing their self- confidence and awareness of their strengths and weaknesses. Hearing impaired adults who participate in literacy programs also benefit from increased opportunities for social interaction. This gives them the opportunity to apply and practice, in informal situations, the skills that they have learned in the more formal classroom environment. Adults who participate in literacy programs have not, for various reasons, previously benefitted from formal education programs. Literacy programs for persons who are deaf provide a safe and nurturing atmosphere in which they can interact with capable experts with whom they can work toward their goals and expectations, and peers with whom they can share their hopes, fears, and dreams.

Adult Literacy and Computer Technology

The Novelty of Technology

Many new methods for teaching have come under the guise of technology. In independent learning centers in the 60s, we found filmstrips and film loops the "way" to let the student learn at his own pace. Later, every classroom had a TV; but, initially, programming was inadequate and boring, and classrooms had to plan their day around the 2 p.m. science lesson. The VCR has helped free the teacher to use TV without being a slave to the schedule. But, according to Paul Welliver at Penn State, who helped pioneer science on TV, researchers found subjects like science really could not be taught on TV. Science is a process approach of discovery and students needed hands on activities.

When the first computers were introduced to the classroom, the novelty also created great excitement. When the novelty wore off, the limitations of the software were evident. However, innovative programming in the last several years now allow the user to be creative as an artist or a writer. To be the creator of something gives an individual a sense of power. Programming has matured to the point where the computer can be a patient teacher, branching to new information when the student is ready. Or the computer can provide the tools for the student to express himself in words or pictures.

In this way, the computer can now help provide the motivation for a student to reach out. It is especially appealing to adult learners because it is an "adult" tool. Other adults use computers to do their work. CAI offers a face-saving way to learn basic skills in a way different from school learning. Many under-educated adults have not had positive experiences with schooling. Using computers allows adults to learn basic skills in new ways--so that they don't have to relive experiences with frustration, failure, and humiliation that they may have endured as children in school. Computers also offer other advantages, summarized by Askov & Turner (1989):

Advantages of Using Computer Technology

1) Privacy - Only the adult and his/her teacher or tutor

needs to know the actual level that the learner is working on.

2) Individualization - Instruction can be tailored to the adult student's needs rather than to those of the group. The teacher can individualize not only the pace of learning but also the content and presentation to the needs and interests of the individual adult student.

3) Achievement gains - Some research studies have demonstrated better than average gains through use of computer technology (Askov, 1986; Askov, Maclay, & Bixler, 1987; Maclay & Askov, 1987; Maclay & Askov, 1988). Clark (1983), however, cautions that achievement gains may not be due to the medium of instruction--that research variables are often confounded. Whether these gains can be maintained over time or whether the skills, once acquired through using computer technology, can be transferred to daily life and retained requires further research. We can say with some degree of certainty, however, that adult students learn more rapidly using computer technology.

4) Cost Effectiveness - An extensive evaluation (Turner & Stockdill, 1987) of an urban technology/literacy center has revealed that delivering instruction through computer technology is no more expensive than traditional instruction with advantages in achievement gains. In fact, more students than originally anticipated could be served through using computers.

5) Control of learning - The adult student gradually takes control of the learning situation as he/she learns how to use the computer. This control of one's own learning processes is perhaps

the most compelling reason to use computers.

6) Flexibility in scheduling - Adults have busy schedules. Literacy classes have to be worked in among job assignments and family activities. Drop-in centers using computers offer flexibility to adults that children in school programs don't require. While this technology may not eliminate the need for group class instruction, it can offer opportunities for instruction in a student's open time slots.

7) Open entry-open exit - Adult education teachers and tutors are well acquainted with the need to accommodate adults whose job schedules change frequently and whose turbulent lives seem to resist regular schedules. Adults frequently drop in and out of programs; computer technology enables teachers and tutors to start where students left off, saving valuable time for both.

8) Modern way to learn - Computers are revolutionizing the workplace; business/industry/labor organizations look to technology to upgrade the learning skills of workers. A certain faith in computer technology exists in the modern mind (Turkle, 1984). This faith can help adult students overcome feelings of inadequacy as they approach the task of learning basic skills as adults (Lewis, 1988).

9) Authoring capability - A creative teacher or tutor may tailor instruction to the needs and interests of the individual student. Bixler & Askov (1988) describe how volunteer tutors were able to create vocabulary lessons geared to the job-preparation needs of displaced homemakers enrolled in a literacy council's

basic skills program until they were qualified to enter a job-training program. Teacher creation options can give teachers and tutors viable and important roles in the use of technology.

Susan Imel, (1989), director of the ERIC Clearinghouse on Adult, Career, and Vocational Education, reminds us that CAI has not been effective with all learners. Some of the problems that can be encountered with computer technology must now be considered.

Disadvantages of Using Computer Technology

Askov & Turner (1989) list several disadvantages, but most relate to the computer hardware. As hardware becomes more sophisticated and user friendly these disadvantages can be overcome. The other disadvantages relate to appropriate implementation training for the teachers.

1) Change - Computer technology is constantly changing. What seemed "state of the art" several years ago is now "primitive." Continual upgrading is necessary to take advantage of the best that technology has to offer (Turner, 1988).

2) Lack of compatibility - Particularly a problem with computer technology, lack of compatibility among machines makes identification and use of appropriate software difficult.

3) Cost - Cost used to be a major barrier to purchasing computers for instruction. Fortunately, costs have come down often making it affordable even to literacy councils which are typically under-funded.

4) Pressure to make rapid decisions - Money for computers sometimes results from an unexpected "windfall," leaving little

time to make informed decisions. Instead of careful planning which should precede innovation, administrators must "use it or lose it;" they may fall prey to a sharp salesperson who may not have the best interests of students in mind.

5) Lack of expertise - A trained resource person needs to be available to set up the equipment, fix malfunctions when they occur, and most importantly, train teachers and tutors in the use of the systems. This resource person also needs to keep up with what is happening not only in computer technology but also adult literacy to keep equipment upgraded and materials current.

6) Inappropriate instruction - Most computer software is designed for children. It may be used with adults with adaptations and care in the way it is presented. As more funding is becoming available for adult instructional programming, vendors will be producing more appropriate materials. Adult educators need to be proactive in making the needs of their students known to vendors.

7) Curriculum integration - It takes time for any innovation to be adapted and adopted in a local program. Similarly, use of a new technology is often viewed as a special event rather than part of the ongoing curriculum. Teachers must become so familiar with the instructional materials offered via the technology that these materials can become part of the instructional choices routinely available to students.

8) Lack of training - Unfortunately when program administrators decide to adopt any technology, especially computers for instruction, usually the first consideration is hardware and then

software. Only after those decisions are made does the realization come that teachers and tutors need to be trained. Instead of training being the first step, it is often an afterthought when the "miracles" of modern technology don't happen automatically.

9) Zenophobia - Zenophobia, fear of the unknown, can result from inadequate training. Teachers and tutors who are inexperienced with computers may be reluctant to use it. This reluctance is transmitted to the adult students who usually are not confident in their abilities anyway (Askov & Brown, 1988). Upfront training time for teachers and tutors can eliminate anxieties; confidence instead of fear is transmitted to students.

10) Role changes - When students use computers, and have control over their personal learning agendas, they become more independent, even self-actualizing. Sometimes teachers and tutors feel displaced, especially tutors who derive satisfaction from one-to-one instruction, and may resist using the new technology. Their role has changed; it's not any less important, but different. Training can overcome these feelings of displacement and give tutors a viable and important role in instruction (Bixler & Askov, 1988).

Why Bother With Computer Technology At All?

With all these considerations and cautions, you may be wondering why programs choose to use computers at all. While they do necessitate extensive training for staff and volunteers, that training has positive effects. Adopting computer technology offers possibilities for staff revitalization. Additional training upgrades the quality of the staff. Most importantly, adoption of computer technology forces teachers, tutors and administrators to rethink what they are doing; it requires that they review the whole curriculum to determine how computer technology best fits (see also, Papagiannis et al., 1987). Periodic review of curriculum makes sense anyway to ensure that instructional goals are still realistic and appropriate.

Perhaps the most compelling reason for using technology is the impact on students. Askov & Brown (1988), report the sense of empowerment and control over their own learning that was expressed especially by the least able readers. Research on the effectiveness of technological approaches for adults has been limited. Recent research studies (Askov, Maclay, and Bixler, 1987; Askov, 1986; Askov and Brown, 1988; Maclay and Askov, 1987; Maclay, 1986; Pastori, 1986), however, have revealed that low-literate adult grow in self-esteem and self-confidence from the use of technological approaches to education. These adults feel that they are at last part of the mainstream culture through their use of technology. Subsequently, they begin to identify with the educational goals of the mainstream culture.

The Office of Technology Assessment (1987) also reports that (CAI) is especially successful in teaching adults with the lowest literacy levels. Not only are teachers revitalized, but so are students. The positive effects of computer technology do not appear to be due to novelty alone because student's attendance records improve with use of computers (Turner & Stockdill, 1987).

Dr. Terilyn C. Turner (1989), of the Adult Literacy and Technology Steering Committee, feels that "nothing can stop the movement towards computers because, as one tutor said to her, 'Once you use them, you never go back'" (p.3).

Using technology encourages a redefinition of literacy instruction. Literacy is no longer based on the assumption that the adult learner is somehow deficient. Learning basic skills while learning to use computers becomes viewed as part of the life-long learning process. Use of computer technology is one of the new basic skills. Learning to read while learning to use computers views literacy instruction as part of the continuing education process.

Adult Literacy, Computer Technology, and the Hearing Impaired

Development of Computer Technology

Computer technology has progressed so rapidly in the last few years that even in 1985, Thorkildsen was so optimistic that he stated, "technology, at its current rate of development, could substantially reduce or completely eliminate the impact of many physical handicaps" (P. 324).

Technology does offer the possibility of a solution, especially as society becomes technologically more complex. As virtually all segments of mainstream society turn increasingly to technology, hearing impaired adults are often left behind. Hearing impaired adults who are also handicapped by low literacy are not only left behind, they are often left out. Because of their lack of basic skills, they are excluded from using technology. Because of high cost, lack of access to equipment, and inappropriate software, they are further denied access to technology for instruction, which holds promise for making a difference in their education and in their lives.

As noted above, technological approaches can provide very effective instruction for low literate adults. Since hearing impaired adults rarely benefit from incidental learning, their acquisition of English language skills depends on direct, intentional, concentrated input (Gallaudet University, no date given). CAI would provide the perfect medium--if designed and used correctly--for developing basic word recognition and comprehension skills.

Computer-assisted instruction has been used to instruct hearing impaired children with some success. Hart-Davis (1985) concluded that CAI can be used successfully with hearing impaired children. The children learned more quickly and showed better retention of the material. Prinz (1984, 1985) conducted a series of studies using CAI with children. The studies conclude that CAI can be very successful in improving language facility and word recognition skills in hearing impaired children. Ross Spuckloss (personal communication, April 1988) indicated that studies involving the use of CAI in reading instruction for deaf teenagers had been conducted in the late 1960s by the National Technical Institute for the Deaf. More recently, the Center on Deafness in Northridge, CA has experimented with using CAI with HI adults (unpublished conference presentation, 1988); however, the results of the program have not been adequately studied. Neither project has been adequately studied.

Benefits for Integrating CAI Into HI Curriculum

Mary Garvey (1985), outlines some of the benefits for integrating CAI into the curriculum of hearing impaired classrooms. These same benefits are mentioned by many other researchers.

1) Computers provide individual instruction - CAI can provide tireless, interesting drill work. Immediate visual feedback can provide rewards and the computer can be programmed to branch to appropriate reinforcement. (Egan, 1985; Fleharty, 1985; Garvey, 1985; Messerly, 1986).

2) Computers allow greater student independence - Students can complete their assignments at their own pace without constant teacher interaction. This independence builds confidence in students who want to be like their hearing peers (Garvey, 1985).

3) Computers increase active participation time - With individually paced lessons a student is kept on task without long waiting periods for teachers' guidance.

4) Computers reinforce the visual learner - Because feedback is visual, the hearing impaired student is rewarded immediately in a familiar way. This encourages the learning process (Egan, 1985; Garvey, 1985).

5) Computers encourage cooperation and communication - Although CAI is usually one-to-one, student to computer, experience shows students interact with other students when working on computer lessons (Garvey, 1985). The computer, with the aid of the

modem, has even allowed students to communicate with each other nationwide. Chemeketa Community College, in Salem, Oregon, has basic skills classes for their deaf students (MacDonald, 1989). These students make extensive use of computers and were the first students on campus to begin a club for communication via modem with other students nationwide. They have TTY on campus and several SuperPhones and have connected the computer to the superphone for communication between hearing and deaf students.

6) Thinking skills developed - A sixth benefit, mentioned by Fleharty (1985), is software that encourages the hearing impaired to think for themselves. Hearing impaired students learn that sometimes specific answers work, but that often many answers are equally correct. They need to use trial and error to find the results of each choice. Programs that encourage students to remember what they entered on the computer and to build on mistakes are excellent for organizational skills, memory, and reasoning.

Approach to Implementation

Boothroyd (1987), suggests some guidelines for an integrated approach to educational programming. These guidelines outline three very important facets for implementing CAI into programming for hearing impaired adults.

First, there is an urgent need for teachers of the deaf to bridge the gap between the researchers and the deaf adult to make sure needs of students are being addressed. Although it is not common with adult literacy programs in general, recent publications from Gallaudet reveal that teachers of the HI are being trained to use computers in the classroom. In 1985, Graham reports that as little as 15 hour workshops were effective in helping educators understand the potential of computer technology. Young (1985) agreed and reported that the Rochester Institute of Technology included faculty training sessions on a regular basis. This training allowed computer-proficient faculty to serve as peer models and were a key resource in the spread of computer literacy on campus. Today, most projects include some teacher training activity before implementing computer technology. Since current software does not teach itself, this training is critical when we remember that a dedicated and knowledgeable teacher can make or break a successful program.

Second, research must move from feasibility studies to applied research. Curriculum developers and program directors must develop and implement model programs which integrate teacher training and CAI in a whole language approach. These programs should be developed with researchers as well as adult students to assure that careful evaluation takes place.

Third, software development must be written by computer specialists, literacy specialists, and hearing impaired specialists working together. Although evidence exists to support the idea that computer-assisted instruction can be used effectively with adults, much computer-assisted instruction software for teaching beginning reading has been designed for young children. This software is generally inappropriate for an older population. Additionally, commercial software usually has not been rigorously evaluated to determine if it is more effective than conventional instruction.

Availability of Computer Software

Garvey, in 1985, reminded us that few commercial software programs were available. Those available for the hearing impaired were expensive and of limited use. Trachtenberg (1986) agreed that computer software which could be used with hearing impaired adults, except for teacher-prepared materials, was virtually impossible to find.

More recently, The Adult Literacy Technology Project (1988) funded by the Gannett Foundation, sponsored a software study to evaluate existing instructional packages for their appropriateness for low-literate adults. A review of software evaluations reveals that no instructional packages have been identified as appropriate for teaching word recognition skills to handicapped adults without adaptations. Nevertheless, the computer offers a new vehicle for instruction, especially for those whose special learning problems and needs defy conventional means.

Today, computer technology is advancing rapidly. No longer is a computer just a number cruncher or an electronic workbook. Software development is no longer the domain of just computer programmers. Today, we see software development and evaluation taking place on three levels: the commercial level, the institutional level, and the individual level.

Commercial Development

On the commercial level, **Apple Computer** has made a commitment to helping the handicapped access their computers. Many developments are in specialized hardware, but over the last two years Apple Computer's Office of Special Education has been accumulating a comprehensive database of information about hardware products and software programs that, when used with Apple products, provide disabled individuals with new options and opportunities. This information is now available in one book called, Apple Computer Resources in Special Education and Rehabilitation. This book also includes lists of publications and organizations all designed to help the disabled child and adult take advantage of the power of computing.

IBM has also been working on a variety of hardware and software adaptations for the handicapped populations. Although designed for speech therapy, the IBM SpeechViewer does provide a well-documented tool designed to increase the efficiency of speech therapy. It provides visual feedback which can motivate a student to participate. IBM also supports three programs by Micro-Interpreter and PC-Fingers that teaches and drills ASL finger spelling and signed words. The IBM Principle of the Alphabet Literacy System (PALS) has been evaluated to be an effective tool in teaching some adults to read and write. It is recommended, however, that it be part of a total program of instruction, since students who do not know the names of letters and sounds may have some difficulty (Njie & Cramer, 1988). Our low-level HI population may also find this too difficult.

There are many other software publishers and journals that evaluate software. The number of programs that really do more than drill are very limited. Any commercial developments must necessarily depend on research, feedback and evaluation from users to continue to improve the usefulness of hardware and software.

Institutional Development

As mentioned before, the **Chemeketa Community College** in Salem, Oregon, has their deaf students using computers to communicate via modem with other students nationwide. They also have equipment to allow the hearing and deaf students communicate. They mostly use the same software that they use in their regular basic skills program.

Gallaudet University, with the emphasis on the latest technology, is exploring much educational software and equipment for its application to the hearing impaired population. The Computer Project Survey (Mackall & Rush, 1988) collected data from 2,000 schools and programs for the hearing impaired in the U.S. and Canada, and has published a summary of those projects. These projects have been cross-indexed by age level, computer type, contact persons, and subject area. Many of the projects are designed to upgrade the skills of teachers, to diagnose reading levels for students, or to drill on basic skills. This book includes helpful information on other resources, library databases for further research and software evaluation centers. There really is no evaluation of how effective the programs are.

Some very creative projects are ongoing and use basic graphics and word processing programs with teachers tailoring the instruction to individual students (Sheie & Hirsch, 1987). Storm (1987) also found that computers can greatly enhance the writing/editing process but require ongoing support from concerned teachers.

In a project by Spidal & Ryan (1987), at the **New York School for the Deaf**, middle school students had access to computers for writing assignments. One conclusion was that computer use should be encouraged for hearing impaired students and students should be allowed ample time to work at their own speed.

The **Penn State Adult Literacy Courseware** was developed with state administrative funds from Chapter I to improve the literacy skills of low literate parents so that they could better help their at-risk children who were enrolled in school Chapter I compensatory programs. This courseware for adult beginning readers was developed using a "whole word" approach with some word building activities in teaching 1,000 high frequency and functional words. The courseware is interactive, branching and responding to the user's answers and needs. In addition, Modules 3 and 6 can be customized by the teacher to include his/her own words and sentences. The courseware consists of several disks which deliver the instructional program and record student responses. A detailed teacher's manual provides instructions on use as well as suggestions for integrating the courseware into ongoing literacy instruction. The Institute for the Study of Adult Literacy and Gallaudet's ABE program are designing several studies to determine it's effectiveness in improving basic English writing and reading for HI adults.

Individual Development

The National Special Education Alliance (NSEA) is a national network of local computer resource centers. Originally composed of eleven non-profit, parent-run sites, there are now more than 50 centers across the U.S. linked by a common passion: to use state-of-the-art technology to better the lives of individuals with disabilities, including the hearing impaired (Green, 1988). The Alliance conducts research and evaluation of hardware and software, especially as it relates to an individual's access to schools and the workplace. They also have a relationship with 50 to 60 vendors, including Apple Computer and IBM, who want feedback on the age appropriateness of software.

Networking and Cooperation Essential

As the Alliance shows, networking can help small centers keep up-to-date with developments in hardware and software. This model of networking must be expanded to include the latest research on adult literacy, the hearing impaired population, and computer technology. As has been shown, specialists in each area can assist other specialists, using the modem and computer itself.

The networks of literacy providers we have across the country can be accessed easily. For example, The Adult Literacy & Technology Project publishes a newsletter and conducts a national conference to keep literacy providers informed of the latest research. A growing number of State Coalitions for Adult Literacy also exist to assist in sharing adult literacy information. These coalitions are linked through The State Literacy Initiative Network, and can share information nationally. In addition, literacy providers can be connected electronically, with AppleLink, nationwide. Information can be shared, questions answered, and problems explored very quickly using this network.

The Future

This network will be even more critical in the future. Some of the exciting developments on the horizon offer even more potential for bridging the gap to success for the low-literate, hearing impaired adult.

As defined by Bosco (1988) interactive video is simply a video source that is controlled by a computer. The two elements, audio-video (AV) and computer-assisted instruction (CAI), have been around for quite a while. The power and flexibility of microcomputer technology, along with refinements of video disc technology, produced an instructional tool that offers new opportunities.

Boothroyd (1987), mentions that the **National Technical Institute for the Deaf** has been using interactive video for several years, with programs for lipreading training, sign language training, and vocabulary development.

The **Alberta Vocational Center** has used a videodisc program to teach communication skills to persons working with HI students. With the student in control of branching to new material, or review of previous information, students' attitudes towards the system were very positive (Thorkildsen, 1985, p. 330).

Since 1980, the **California School for the Deaf at Riverside** has served as one model for the practical application of interactive videodisc technology (Osksa, 1987). They have developed an authoring program that uses nine question types for the teaching of language tasks, compared to the simple true/false, multiple choice, or fill-in-the-blank questions originally used. Osksa (1987), reminds us that "most people think of interactive videodisc technology as the union of computers and videodisc players, forgetting that the third and most important ingredient is the student" (p. 86).

Although Bosco (1988) reminds us that although there is nothing intrinsic in the new technology that guarantees it will produce beneficial effects, it deserves serious consideration by those working with adult literacy. "Interactive video should serve as a catalyst for the imagination and enable us to design fresh new approaches that are based on a good understanding of who the learner is and how he or she learns" (p. 9).

Summary and Recommendations

It is now within our reach, as professionals, to help low-literate, hearing impaired adults bridge the gap between where they are now and where they would like to be--functional, literate adults in a modern world. Research can help us understand the underlying problems we face. Teachers can help us understand the reality of the student's needs. Computer companies know there is a market waiting to be tapped and are waiting for feedback on what we want. Networking can help us all build on each other's successes for the benefit of the low-literate, hearing impaired adult. This networking should involve partnerships among commercial companies, universities, and service providers. Therefore, we recommend that literacy researchers and HI specialists:

1) continue research and development activities, building on current research in adult literacy and applying it to the HI population;
2) evaluate carefully the effectiveness of pilot projects;
3) encourage more teacher training and technical assistance in computer technology; and
4) communicate with ongoing projects and organizations across the country to share information.

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APPENDIX

ADULT LITERACY IN THE UNITED STATES TODAY

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There are many Americans who do not have literacy skills adequate to meet their needs and ambitions. This is a problem that has become the focus of much concern and a growing level of action throughout the country. This paper addresses some of the issues related to the problem. It is divided into four sections. The first gives an overview of the problem in the United States today. The second part discusses how the problem is being attacked. The third part identifies some issues related to the delivery of literacy services. The fourth section provides the addresses and phone numbers of many of the agencies mentioned throughout the paper.

OVERVIEW

This section serves as an introduction to and an overview of some of the issues surrounding the problem of illiteracy in the United States today. These issues include how to define literacy, how it has been measured, and some estimates of how many people are "illiterate" in society today, who they are and where they are located. Other issues central to the problem will also be discussed.

Defining Literacy

In its simplest definition, literacy is the ability to read and write. Illiteracy typically refers to the state of not having mastered the basic skills of reading; recognizing letters, decoding, encoding. In recent years, the concept of functional literacy has been discussed by the experts. This is a more complex issue, referring to the ability to complete tasks necessary as defined by one's environment. The person classified as not functionally literate has often mastered letter recognition and word recognition. The tasks he or she faces usually go beyond the ability to recognize a few simple words and sign one's name, however. They may include tasks necessary to get by in daily life, such as reading street signs in an unfamiliar neighborhood or reading the insert that comes with the phone bill. They may include tasks necessary to get by on the job, such as reading a set of blueprints. They also include tasks that the individual desires to be able to complete because they make his or her life more fulfilling, such as reading the newspaper or novels. It is now being realized that what constitutes "literacy" will vary with the context in which a person is functioning; for example, as a worker, citizen, consumer and parent. Functional definitions of literacy also imply that as people move or society changes, literacy needs of individuals may change (Harman, 1985, 1987).

Workplace literacy has become a national priority as American businesses and industries attempt to define their workplace literacy needs. As technology continues to upgrade jobs, entry level job requirements continue to rise. Low skill level jobs are quickly becoming obsolete and entry level jobs are requiring higher basic skills competency levels.

Ways Literacy Has Been Measured

Grade Level Standards

Grade level estimates are arrived at by examining representative samples of children to establish the mean level of ability for children at that grade level. Standardized tests that yield grade equivalent scores normed on children are probably not applicable to adults (Harman, 1985).

Grades Completed in School

Completion of an arbitrary grade (usually fourth or fifth; sometimes high school graduation) is taken as an indication that the person is literate. These standards mean little; it is evident that some high school graduates do not possess sufficient skills to cope in today's society (Levine, 1982). Without practice, basic skills become dull and ineffective. Many adults who have been out of school and have not used their skills often find their basic skills are "rusting" due to a lack of use.

Adult Functional Competence

This class of measures reflects the idea of functional literacy. These measures are constructed by defining a set of skills necessary for adult functioning; they are then used to test people on this set of skills.

Recent Statistics On Illiteracy in the United States

Bureau of the Census Studies

Since 1840, literacy rates have been reported every decade on the basis of census figures. Rates are calculated by asking people how many years of school they have completed; an individual who has completed the fourth or fifth grade level is counted as literate (Harman, 1987). These estimates of literacy are typically high; in 1982, only 8.3% of the population 25 years of age and older had not completed elementary school, and only 3% had less than 4 years of schooling (Bogue, 1985).

National Studies

Many national studies have been recently undertaken to determine how many individuals are illiterate. These studies use the functional competency definition of literacy. The Adult Performance Level (APL) Study, funded by the United States Office of Education, found that at least 23 million Americans may not be functionally literate (Northcutt, 1975). The English Language Proficiency Survey (ELPS) was developed by the United States Department of Education and administered by the Bureau of the Census; between 17 and 21 million adults were classified as illiterate according to this test (U.S. Department of Education, 1986). Most recently, the National Assessment of Educational Progress (NAEP) conducted by Educational Testing Service found that 50% of the young adults tested (ages 21-21) were "mid-level" literates as defined by their performance on the range of tasks presented to them. These young adults had difficulties with the complex information processing skills required by tasks at the upper end of the scale that may characterize the complex thinking that is required in today's society (Kirsch & Jungeblut, 1986; Venezky, Kaestle, & Sum, 1987). It is estimated that the pool of individuals with inadequate literacy skills is growing by 2.3 million per year, including dropouts, immigrants, and refugees (Joint Committee on the Library, 1984).

Who Are The Low-literate Adults?

Of the most recent national surveys, only the ELPS provides data describing the population defined as illiterate according to the cutoff score on the ELPS test. The NAEP has no cutoff score below which individuals are defined to be illiterate. For this reason, data from the ELPS describing those found to be illiterate will be discussed along with data on educational achievement which is often used as a criterion for literacy.

According to ELPS, of all adults classified as illiterate, 56% are under the age of 50 and 37% speak a non-English language at home. Among native English speakers classified as illiterate, 70% did not finish high school, 42% had no earnings in the previous year and 35% were in their 20's and 30's. Among illiterate adults who use a non-English language, 82% were born outside of the United States and 21% had entered the U.S. within the past six years (U.S. Department of Education, 1986).

The undereducated in the U.S. are primarily the poor and racial and ethnic minorities. The proportion of persons who completed fewer than six grades of school on public assistance is more than double that among those who completed six to eight years and almost four times that among those who completed nine to eleven years of school (Hunter & Harman, 1979). Welfare participants are a significant part of a complex and costly national employment problem; between 35% and 45% of welfare participants have not completed high school. In 1982, the yearly cost of welfare programs and unemployment compensation was estimated at $6 billion (Wellborn, 1982). Across all levels of education, Blacks, Hispanics, Native Americans, and Mexican Americans rank lower than majority group members (Bogue, 1985; Hodgkinson, 1985; Hunter & Harman, 1979).

The young and the old also tend to be among the educationally disadvantaged. There is a heavy concentration of older persons among adults 16 years of age and older with less than a high school education and not enrolled in school. About 2 out of 3 are over 45; about 1 in 4 is 65 or older. Between 1965 and 1973, over 3.1 million young people between 16 and 21 years of age dropped out of high school. In the period 1974 to 1975, 25.3% of all dropouts between the ages of 16 and 24 were unemployed; 61.4% of those nonwhites who dropped out of school were unemployed (Hunter & Harman, 1979).

The undereducated also tend to be found in prisons. State prison populations have doubling since 1969. There are over 1/2 million prisoners in federal and state prisons. The Correctional Education Association estimates that 60% of them cannot read write and compute at the third grade level (Joint Committee on the

Library, 1984). The National Institute of Corrections (NIC), the education division of the U.S. Department of Justice, reports that 50% of adults in federal and state prisons cannot read and write at all (BCEL, 1986). About 75% have not completed high school, as opposed to 38% of the total adult population (Hunter & Harman, 1979). The majority of prison inmates are poor, the number of minorities in prison is disproportionately higher than nationwide numbers, and eventually 95% of all those in prison return to society . In 1983, only 12% of the total prison population had access to basic and vocational education and less than a third of inmates were in any kind of educational program (BCEL, 1986). Since 1984, the NIC has been funding educational projects in prisons, especially computer-assisted instruction.

Finally, women tend to be among the undereducated. Of the population over 25 who have not completed high school, 20 million are men and 22 million are women. Of those who have an eighth grade education or less, more are men than women (6.7 million compared to 5.8 million). But of those who dropped out of high school, many more are women (10.3 million as opposed to 7.9 million men) (Hunter & Harman, 1979).

Two populations have become a new focus of concern: the American workforce and the homeless. Seventy-five percent of the American workforce for the year 2000 are adults today and 80% of the workforce new entrants will be minorities, women and immigrants (Jump Start, 1988; Workforce 2000) As such, training and retraining must be targeted toward the needs of older and educationally disadvantaged learners.

Attention is now being paid to the needs of the homeless. It has been estimated by the National Coalition for the Homeless in Washington that there are approximately 3 million homeless people in the United States, although some reports indicate larger numbers, and the number is growing.

The role of literacy in helping to reduce the number of homeless is rather controversial as the correlation between homelessness and illiteracy has not yet been determined. The experiences of many city programs has indicated that a lack of basic literacy skills is common within this population and that this educational disadvantage is a barrier to securing better paying jobs (BCEL, 1988).

Where Are The Low-literate Adults?

Persons in our society who lack sufficient reading and writing skills to function effectively are found in large numbers wherever there are poor people and congregated racial and ethnic minority groups. They are found in city ghettos and on unmechanized farms. More undereducated adults live in urban areas; this seems logical due to the higher concentration of people in these areas overall. However, in rural areas only about 46% complete high school, while in suburban areas the percentage is 70; in central cities, 61% complete high school (Hunter & Harman, 1979). The ELPS found that of all adults classified as illiterate, 41% live in central cites of metropolitan areas, compared to 8% in rural areas (U.S. Department of Education, 1986). There are more educationally disadvantaged individuals in the south and east than in the north and west (Hunter & Harman, 1979; U.S. Department of Education, 1986).

Intergenerational and Cultural Illiteracy

Children of adults whose literacy skills are inadequate for the tasks in which they need to or wish to participate may also grow up to have inadequate literacy skills; the pattern may span generations (Sticht, 1983, 1987). Cycles of poverty and illiteracy are intergenerational in nature (Kirsch & Jungeblut, 1986; Anderson, Hiebert, Scott, Wilkinson, 1984; Thompson, 1985; Segalman, 1981). As one indication of this effect, parents who drop out of school are more likely to have children who drop out of school (Winters et al, 1987). The value that family members place on literacy may influence the level that family members aim to attain and eventually achieve, regardless of the availability of or participation in services. However, the relationship among influencing factors is complex; various cognitive and affective measures related to school achievement are strongly related to the mother's (but not the father's) level of educational attainment (Laosa, 1982). Likewise, the value that the culture places on literacy may influence the level that members aim to attain and eventually achieve, again regardless of the availability of, or level of participation in, services (Harman, 1987).

Effects of Illiteracy on the Workplace

Individuals with inadequate literacy skills are blamed for causing problems in the workplace ranging from wasted investment in new equipment to productivity difficulties to outright safety hazards (Hymowitz, 1981). David Kearns, Chairman and Chief Executive Officer of Xerox Corporation, has said that American businesses will have to hire more than a million new service and production workers a year who can't read, write or count. Teaching them how, and absorbing the lost productivity while they are learning, will cost industry $25 billion a year (Kearns, 1986). A 1982 Center for Public Resources Study examined over 200 U.S. corporations with 500 or more employees and found that employers believe the cost of basic skills deficiencies is high, but the overwhelming majority of companies have not estimated either direct or indirect costs. Over 65% of respondents in this study said that basic skills deficiencies limit advancement of high school graduate employees and 73 percent said deficiencies inhibit advancement of non-graduates (Mark, 1984). [see also Collin, Aderman, and Askov, 1988.]

Twenty-five million American workers will need to upgrade their skills by almost 40% during the 1990's (Packard, 1988). Almost one out of every three adult Americans lacks the skills necessary for training or retraining for upgraded jobs (Lieberman, 1989). By the year 2000, an estimated 5 to 15 million manufacturing jobs will require different skills than they do today (ASTD, 1988). As entry level jobs require higher skill levels due to technological upgrading of jobs, low skill level jobs are becoming obsolete. In 1984, it was estimated that most occupations required a high level of basic skills (10th to 12th grade levels), an estimate that is already five years old (Sticht and Mikulecky, 1984). The workplace requires not only the ability to read write and compute but also the ability to use these skills in problem solving on the job. In addition, as jobs become increasingly technology-based and complex, the basic skill levels necessary for performance will continue to rise. Research suggests there is a relationship between the basic skills levels of workers and job performance, but the relationship is by no means overwhelming or direct [see also Mikulecky & Ehlinger, 1986; Mikulecky, Ehlinger & Meenan, 1987; and Rush, Moe & Storlie, 1986].

In relation to job performance, it is considerably more important to apply basic skills in specific job situations than it is to demonstrate such skills on standardized tests. Specific, job-oriented basic skills instruction is used by employers and is more effective than general literacy skills instruction in improving productivity and job performance (see also Sticht, 1987).

A 1987 report by the National Association of Manufacturers (NAM) emphasized that the quality of the U.S. workforce had suffered from inadequate skill competencies and recommended that basic skills instruction become a priority to meet the challenges of a technological and highly competitive world. According to a study conducted by Lieberman Research Inc for Fortune Magazine and Allstate Insurance (1989), most companies in the United States report that it is difficult to hire new employees with good basic skills and that they expect it to become more difficult during the next ten years. Almost half of the companies studied by Lieberman indicated a reduction in productivity due to poor basic skills in their workforce and many believed that this was creating a problem in competing with foreign companies.

The Center for Public Resources Survey of Basic Skills in the United States Workforce (1982) listed common basic skills problems in the workforce including 1) secretaries having problems reading at levels required by their job, 2) managers ands supervisors unable to write paragraphs without grammatical errors, and 3) skilled and semi-skilled employees unable to use decimals and fractions (Bottom Line, 1988). [A more extensive discussion can be found in Collino, Aderman and Askov, 1988.]

Literacy in the Military

Every year, Armed Forces applicants are selected through an extensive aptitude and ability testing program which includes paragraph comprehension and vocabulary subtests. The median reading grade level of entering recruits is 9.5 (Sticht, 1982). Approximately 40% read below the ninth grade level and 6% read below a seventh grade level (Duffy, 1983). Sachar and Duffy (1975) found that literacy skills were unrelated to nonacademic performance in recruit training; they did predict success in academic phases of recruit training, however. Text is central to the technical skill training program. Thus, there are significant literacy demands in a military career (Duffy, 1983); again, these appear to be in applications of basic literacy skills. This implies that the basic skills are a crucial foundation for later advancement.

What Is Being Done to Combat Illiteracy?

This section highlights the types of literacy services available and their major providers. Effective Adult Literacy Programs, edited by Renee Lerche (1985) provides an overview of how literacy programs structure aspects of their program operation and management to meet their objectives. It is a synthesis of the findings of the National Adult Literacy Project, a U.S. Government-funded study.

Advocacy, Awareness, Information, Referral Services

In September, 1983, President Reagan announced that the Department of Education was launching a National Adult Literacy Initiative to increase public awareness of the problem and to enhance existing services. It was mandated to coordinate Federal literacy programs and to promote private sector involvement in this area (Kahn, 1986). The Adult Literacy Initiative. publishes the ALI Update, which provides current information on major literacy activities. FICE (Federal Interagency Committee on Education) provides information and recommendations which will assist in coordinating and supporting this government-wide, Administration initiative.

The Coalition for Literacy is a group of eleven national literacy and adult education organizations whose goal is to conduct a nationwide multimedia campaign to focus attention on the problem of illiteracy and link existing services with new resources at the local, state and national level. The Business Council for

Effective Literacy (BCEL) was formed in late 1983 to encourage business and industry to join the effort to promote literacy. They provided a $400,000 grant to help launch the national awareness campaign jointly sponsored by the Coalition for Literacy and the Advertising Council in the fall of 1984 (Harman, 1985). One act of this three year campaign was to give tutors and potential corporate donors local and national call-in numbers to make it easier for them to donate time or services (Joint Committee on the Library, 1984). The Library of Congress is expanding the scope of its National Referral Service to include current information about organizations nationwide concerned with reading and literacy development. The information is available by telephone and mail (Joint Committee on the Library, 1984).

In December, 1985, the American Broadcasting Company and the Public Broadcasting Service announced a joint public service campaign on the subject of adult literacy - Project Literacy U.S (PLUS). The two goals of the PLUS plan include: generating community action programs to deal locally with literacy issues; and emphasizing awareness-raising about the problem through on-air radio and television programming. The effort will run through the end of June, 1989 (A White Paper; PLUS, 1985). The effort is described more fully in a manual published by PLUS (see the last section of this paper for the address to write for the manual). In addition, CONTACT Literacy Center, Lincoln, Nebraska, is a national information and referral service with links to thousands of community projects, service agencies, and planning groups around the U.S. (Joint Committee on the Library, 1984).

Federal Programs

Programs Provided Through the Adult Education Act

The federal government is the largest provider of programs in basic skills for adults. Through the Adult Education Act, first enacted in 1966 and amended several times since, monies are made available to the states for the purpose of conducting Adult Basic Education (ABE), high school equivalency (GED), and English as a Second Language (ESL) classes. ABE classes are targeted at adults who wish to work on very basic skills (often equated with the 0-4 grade level). High school equivalency courses are targeted at those seeking to complete secondary education. They may obtain certification known as the GED (General Equivalency Diploma) Certificate. The test for the GED has just been revised, and the new test was put into use in January, 1988. This test includes an essay-writing portion. The American Council on Education publishes a newsletter called GED Items, which keeps readers up to date on issues relevant to GED testing. Their monographs provide useful information related to the GED. ESL courses are provided to those new immigrants who must master English. The programs provide language skills as well as an introduction to American society. ABE/ESL programs provide basic skills training for most of the 1.3 million new immigrants to the U.S each year (Joint Committee on the Library, 1984). In the 1985 fiscal year, federal allocations to these activities totaled $100 million, with an additional $200 million made available by state and local resources. Enrollment in 1985 was estimated to be 2.6 million people, 25% of whom were enrolled in GED courses, 50% in ESL classes, and the remainder in ABE classes. However, the programs conducted under the jurisdiction of the Adult Education Act serve only 3-4% of those in need (Harman, 1985).

The public school system is also a major provider under the Adult Education Act. Courses may be provided to the community, usually in conjunction with ABE. Usually the role of the school is to make space available and encourage the participation of parents. Some schools have acted independently to organize courses. The extent of such activity is unknown (Harman, 1985). In 1987, almost 3 million Americans participated in programs funded by the Adult Education Act.

The following outlines federal education programs with an emphasis on adult literacy:

"School, College and University Partnerships", under the Higher Education Act of 1965, encourages the building of partnerships between higher education institutions and secondary schools serving low-income students. The purpose of the partnerships is to support programs that improve the academic skills of students and thereby increase the opportunity for continued education and employment.

The Augustus F. Hawkins-Robert T. Stafford Elementary and Secondary School Improvement Amendments of 1988 are amendments to the Elementary and Secondary Education Act of 1965. These amendments include a variety of new programs such as: The Fund for the Improvement and Reform of Schools and Teaching (FIRST) and the Even Start Program. FIRST, although focusing on elementary and secondary education reform, stresses the need for parental involvement in the educational process. The Even Start Program supports the development of family-centered education programs to help parents become full partners in the education of their children and to provide literacy training for parents in the program.

In August of 1987, the Re-authorization of the Adult Education Act was proposed. Vice-President Dan Quayle, then U.S. Senator, endorsed the Re-authorization in 1987 with S. 1229 which extended the Adult Education Act for four additional years ending in 1992. His support was based on the close tie between literacy and the productivity of workers.

The Education for a Competitive America Act (S. 406) was enacted to increase authorization in several existing federal programs and to authorize new federal programs to strengthen the competitiveness of American industry. It was intended as a part of the Omnibus Trade legislation and includes three literacy initiatives: 1) the Literacy Corps Assistance Act, 2) the Workplace Literacy Assistance Program, and 3) the Technology Education Act.

The Literacy Corps Assistance Act ,as originally proposed by U.S. Senator Kennedy, was modeled after the Washington Education Project. As a part of the Omnibus Trade Bill (1988), the Literacy Corps Act provides funding for start-up grants for colleges and universities to establish literacy corps programs on campus. The literacy corps concept is a solution to the need for well trained volunteer tutors in adult literacy programs. College students are recruited and trained in a three-credit college course as volunteers.

The Workplace Literacy Assistance Program funds small demonstration projects that are designed as partnerships between businesses, labor organizations, or private industry councils and state or local educational agencies, higher education institutions or schools. The purpose of the partnership is to provide the necessary education needed to enable workers to improve their competency and upgrade their skills.

The Technology Education Act funds projects that offer instruction in fundamental knowledge of technology and its applications to current systems.

The Library Service and Construction Act initiated Title VI, the Library Literacy Program in 1985. This program supports the development of state and local library services focusing on the needs of low-literate adults.

Jump Start, a report released by the Southport Institute for Policy Analysis and Forrest Chisman in January of 1989, examined the federal government's role in adult literacy. Chisman recommends that the government "jump-start" a national movement to upgrade the basic skills of Americans in order to increase productivity in the workplace and to improve social functioning. Chisman finds the national literacy effort to be intellectually weak and institutionally fragmented (BCEL, 1989). Jump Start recommends that a new bill, the Adult Basic Skills Education Act of 1989, be enacted to provide a stronger intellectual and information base and to provide federal incentives for training basic skills instructors and developing instruction using technology. Another purpose of the proposed Act would be to strengthen the ability of states to coordinate and upgrade the delivery of adult basic skills services (BCEL, 1989). In order to maximize the effectiveness of the new Act, Jump Start includes suggested amendments to current programs to support the federal effort. The JOB Training Partnership Act (JTPA), The Carl D. Perkins Vocational Act, The Adult Education Act (ABE), The Family Support Act of 1988 (Welfare Reform), The Even Start Program and VISTA have been targeted toward the establishment of a national initiative (BCEL, 1989). Jump Start is the first study and analysis of its kind, researched and presented by an independent and nonpartisan source (BCEL, 1989).

Programs Provided Through Federal Agencies

In addition to the programs conducted by the Adult Education Act, the federal government provides for instruction through other frameworks - the military, prisons (federal and state) and job training programs for unemployed youth are some examples. Approximately 300,000 people participate each year in activities conducted within these frameworks (Harman, 1985).

The Literacy Management Information Project Report (Kahn, 1986) identified 79 literacy related programs administered by 14 Federal agencies. For Fiscal Year 1985, these programs were able to identify $347.6 million which had been used for literacy activities. Eight of the 79 programs are designated as primary providers of literacy services - literacy is stated as a priority objective in the program's authorizing legislation. Forty-four are considered to be secondary providers (literacy-related projects are approved activities that support the primary objective of the program); while 27 are indirect providers (no explicit legislative mandate exists for literacy activities in these programs - a separate policy decision is required to fund literacy activities).

The fourteen federal agencies include; ACTION; Agriculture; Appalachian Regional Commission; Defense; Education; Health and Human Services; Housing and Urban Development; Interior; Justice; Labor; Library of Congress; Tennessee Valley Authority; Transportation; and Veterans. Only two agencies are primary providers of literacy programs; they are Education and Justice (with four primary programs each). Education also provides the most programs (29) while Health and Human Services provides the second most programs (12).

Nature of Literacy Programs in the Federal Agencies.

Many programs focus on helping individuals gain skills to help obtain employment or to live independently. Nineteen programs in seven agencies have job training programs with basic skills components. Eleven Federal programs help the disabled and handicapped gain life skills. The Department of Education addresses adult literacy directly in its Adult Education program, which provides formula grants to states. The Department also funds vocational training programs containing basic skills components; bilingual education programs; and programs for the handicapped and learning disabled. The Department also is responsible for the Adult Literacy Initiative. The Department of Health and Human Service's Head Start program recently initiated a pilot, parent enrichment program to focus on the educational needs of pre-schooler's parents. HHS also has programs which address the needs of refugees, the aging, the handicapped, and the disabled. Literacy activities could also be carried out under HHS' Social Services Block Grant and Community Development Block Grant. The Armed Services conduct basic skills courses as part of their training programs. Federal prisons sponsor literacy programs. ACTION has made literacy one of the priorities of its volunteer programs through its VISTA Literacy Corps. Basic skills training is provided as part of the employment and training programs administered by the Department of Labor. The Department of Housing and Urban Development's Community Development Block Grants spend money on public services including literacy programs. Library programs, including the Library of Congress, the National Commission on Libraries and Information Services, and the Department of Education's library programs serve as the focal point and initiator of literacy programs.

Federal Dollars Spent on Literacy Activities

In Fiscal Year 1985, the 8 primary providers spent $104,903,000 on all activities; $84,365,018 was spent on literacy-related activities. This represents 81% of all dollars spent.

Most of the other monies expended by the primary providers assisted adults in obtaining high school diplomas or equivalency degrees. The 44 secondary providers spent $11,144,744,070 on all activities; $255,087,975 was spent on literacy-related activities. This represents only 2% of all the dollars expended. The 27 indirect providers spent $14,537,445,624 on all activities; $8,109,163 was spent on literacy-related activities.

Other Programs

Libraries

There are 15,000 libraries in the United States. Guided by their national association, the American Library Association (ALA), many have made facilities available for programs, initiated instruction on their own, and have worked in cooperation with other literacy providers. Unfortunately, just how many participate is unknown (Harman, 1985). ALA was instrumental in founding the Coalition for Literacy (Joint Committee on the Library, 1984).

LVA and LLA

Laubach Literacy Action (LLA) and Literacy Volunteers of America (LVA) are two national, independent voluntary organizations. Laubach, started in 1929, operates through over 500 local councils around the country and has 50,000 volunteer tutors who work with an estimated 60,000 adults, mostly in small groups or individually. A central national office in Syracuse, New York provides a certification program for new volunteers and provides local affiliates with instructional materials published by Laubach. LVA was formed in 1967 and also operates out of Syracuse. It operates through 200 local offices, and uses approximately 15,000 tutors to train 21,000 adults. Tutors are trained and certified before they begin. The local affiliates receive technical assistance and instructional materials from the central office as well as the state-level organizations with which they are associated. Volunteers associated with both organizations function either independently or in conjunction with other groups

(Harman, 1985).

Community Development Agencies

The Association for Community Based Education (ACBE) has attempted to organize community groups providing services and is able to provide some data on literacy programs provided through community-based organizations. Among ACBE members, it is estimated that 35,000 to 53,000 people are being served in literacy classes. Some of these classes are held in conjunction with other organizations, such as LVA or ABE. ACBE has identified 3500 non-members and estimates that together ACBE members and non-members are providing basic skill services to 600-700,000 people (Harman, 1985).

Churches

Churches may be among the organizations counted by ACBE. Church efforts that are national in scope include those undertaken by the Lutheran Women and the Southern Baptist Convention (Harman, 1985). The Lutheran Church of America, for example, operates ecumenical community-based literacy projects in all fifty states. Their 15 year old volunteer Reading Aids Program recruits and trains tutors, and provides technical and consulting services. The Southern Baptist Convention's national literacy program is 25 years old. Five-hundred workshop leaders serve as literacy tutors (Joint Committee on the Library, 1984).Most activity is conducted in local churches, thus information on programs and participation data is difficult to obtain (Harman, 1985). The Association of Church and Synagogue Libraries is developing a literacy and reading training project for its members (Joint Committee on the Library, 1984).

Community Colleges and Universities

Community colleges may provide facilities for programs run by other groups, such as LVA, LLA, and ABE, and so some of these may by counted by ACBE. However, many community colleges also run classes for entering students who have been found to have severe problems in basic skills and require remediation in these areas. As many as half of the entering students may require basic skills remediation. Many universities are also providing (and even requiring) remediation in basic skills for those students who are found to have deficiencies. At UCLA, up to 60% of entering freshman in 1982 failed the English proficiency exam (Rouche, Baker, and Rouche, 1984). Although precise numbers have not been estimated, several million people a year may be served through this vehicle (Harman, 1985). Other types of programs are also being carried out in these settings. At Central Piedmont Community College in Charlotte, N.C., a project called ABLE (Adult Basic Literacy Education) is examining the use of computers and other technologies in instructing adults in basic skills. In the U.S. Department of Education's College Work Study Program, students are trained and paid to assist in local literacy programs (Joint Committee on the Library, 1984).

The literacy corps concept was originally established at the University of Miami where Norman Manasa, enrolled as a an undergraduate, developed a program for college students to volunteer as tutors in local prisons and Head Start programs. Following his graduation from the university, Manasa became Director of the Washington Education Project. The purpose of the Washington Education Project has been to raise funds from major corporations to establish college and university literacy corps programs. Senator Kennedy's Literacy Corps Assistance Act was modeled after Manasa's program and became part of the 1988 Omnibus Trade Bill.

The Pennsylvania Literacy Corps Pilot Program, coordinated by the Institute for the Study of Adult Literacy, has developed a three credit college course that was available to Penn State students during the Spring 1989 semester. The course, Adult Literacy: Focus on Volunteers, offered college students an opportunity to explore adult education as a career option, to fine-tune their own basic skills (including critical thinking and study skills) while teaching adults with low skill levels and to become involved as a volunteer. The course required 60 hours of volunteer service with a local literacy program. Volunteer service options included, but were not limited to, tutoring. The Program encouraged students to volunteer their own talents and expertise to meet the needs of the literacy program.

Business and Labor

Lusterman (1977) found that 1% of training in U.S. businesses is in basic literacy education. A more recent survey found that roughly 53,000 businesses and corporations provide basic skills instruction. Much of the instruction is conducted in-house by paid instructors, while some is contracted to other providers.

As many as 350,000 to 600,000 people attend corporate-sponsored basic skills programs (Harman, 1985). In 1982 the Center for Public Resources studied over 200 U.S. corporations with 500 or more employees. CPR found that 75% of these companies conduct some kind of basic skills competency program for their employees in-house. At least half of these emphasize math and speaking and listening skills (Mark, 1984). There is some evidence that employers are taking a somewhat larger role in providing basic skills training for their employees; however, they are more likely to be training employees at all levels in job-specific literacy skills (i.e. management training in communications skills to technical training in blueprint or machine operation job sheets) (Sticht & Mikulecky, 1984).

Businesses have also provided assistance in avenues other than basic skills training. BCEL was formed in 1984 to improve corporate awareness of illiteracy and increase business support for literacy efforts. Its newsletter provides tips on how corporations can help. Corporations also give tax deductible contributions to such organizations as ACBE, Coalition for Literacy, LLA, and LVA. B. Dalton Bookseller, a partner in the Coalition for Literacy, launched a four year, $3 million grant program to develop and support literacy projects in areas where B. Dalton stores are located (Joint Committee on the Library, 1984). This effort has recently been terminated since B. Dalton Booksellers has been sold.

Labor unions have sponsored basic skills programs using monies from education funds that accumulate through contributions from employees and from membership dues. Locals, central union efforts, and the education department of the AFL-CIO have all participated in such programs. Some of the activities are conducted in conjunction with other providers, often through union educational programs conducted in-house.Evidence indicates that these efforts are supported but not very widespread. Estimates of participation range from 20,000 - 100,000 (Harman, 1985).

Issues Related to Delivery of Services

This section will highlight some other important issues related to delivery of literacy services.

Patterns of Participation

Literacy programs have a pattern of participation that may restrict achievement. Individuals may attend several classes, then stop coming, either to return several classes later or not at all. Dropout rates in literacy programs are around 50%. In addition, individuals who drop out of one program may be apt to join another program and be counted as another individual served when in reality the same person is being served by several programs at different times. Since many times literacy programs are joint efforts by many organizations (for example a Laubach-trained tutor many be working in a prison program), double-counting of participants often occurs; the same person is counted as being served by two or more programs. This makes the numbers of individuals being served by all programs seem higher than they really are (Harman, 1985).

Materials and Instructional Approaches

Many materials used with adult students have been designed for use with children. For example, Nafziger, Thompson, Hiscox and Owen (1976) found that less than 30 tests of reading ability had been designed for use with adults. Others, although they have been designed for adults, take an approach much like children's beginning reading books (for example, the Laubach materials). Some exceptions include: the APL curriculum designed by the University of Texas and still used in some programs today; CASAS (California Adult Student Assessment System) and the CCP (Comprehensive Competencies Program) (Taggart, 1986). CASAS enables adult educators to develop and evaluate a life skills curriculum for competency-based programs (Rickard, 1981). CCP covers academic competencies as well as functional competencies. Research and development of materials specifically designed for adults is needed immediately. Computer-assisted instruction and other technologies (i.e. videodisc) hold promise for adult instruction, as indicated by the success of the Penn State Adult Literacy Courseware (Askov, Maclay, and Bixler, 1988; Askov, Maclay, and Bixler, 1986; Maclay and Askov, 1988), the IBM PALS program (IBM, 1987) and the Wisher Program (Levine & McFadden, 1987).

Use of Volunteers in Literacy Programs

Volunteers provide a common thread among literacy programs; many programs rely on volunteers to do their jobs. However, two myths surround the use of volunteers in literacy programs. The first is that by recruiting and training enough volunteers the problem of illiteracy will be solved. The social problems perpetuating illiteracy are too complex to be solved so easily. The second is that donated time is cost-free or low-cost. A successful volunteer program involves proper training, managing, and support of volunteers, all of which involve cost (Kangisser, 1985; Jump Start, 1989).

Professionalism

Although training for literacy tutors is scant or non-existent (Harman, 1985), professionalism in the field is increasing (Kangisser, 1985). Training programs are becoming more elaborate and tutors are comparing methods and experiences through avenues such as conferences. This is crucial because folklore or intuition is not sufficient to use in approaching adult instruction. Teaching adults is different than teaching children; we are only beginning to learn about methods and materials appropriate for adult instruction. More research on these methods and materials is needed. [See also Kazemak, F.E. (November, 1988). Necessary changes: Professional involvement in adult literacy programs, Harvard Educational Review.]

Coordination Among Agencies

One of the trends in providing literacy services that will undoubtedly continue into the future is the coordination among federal and state agencies in providing literacy services. An example of this is a project called GAIN in California, in which literacy classes are required for an individual before he or she can draw unemployment if he or she has been found to have inadequate literacy skills. This trend could result in better and more efficient service of individual needs. Cooperation among agencies is an important factor in the successful provision of literacy services.

The Gannett Foundation provided funding for the development of state level coalitions for adult literacy beginning in 1985. This Foundation's support has helped State Coalitions promote adult literacy activities within their states and provide a framework for the development of comprehensive state plans for improving adult literacy levels. In addition to state level coalitions, local literacy coalitions are forming in some areas of the country. Most coalitions include representatives from various sectors of the community including literacy and adult education, business and industry, labor organizations and associations, social and welfare agencies and schools and higher education institutions. The mission of most local literacy coalitions is sharing and networking of resources and joint planning and development of community and workplace literacy programs.

Agencies

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Coalition for Literacy
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LLA (Laubach Literacy International)
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LITERACY AND THE HEARING IMPAIRED:
LIVING, MOVING, DYNAMIC TEXT

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LITERACY AND THE HEARING IMPAIRED: LIVING, MOVING, DYNAMIC TEXT

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The hearing impaired person must rely upon the visual system for his or her major communication needs. Therefore, it is essential that we define the characteristics of visual perception and note weaknesses and strengths with respect to communication skills. If we compare auditory and visual sensory systems, the most obvious difference is that the auditory system is a global. That is, signals can reach the person from any direction, 24 hours a day. The auditory system is primarily an early warning system that is always "on". On the other hand, the visual system is directional rather than global and dependent upon sufficient light sources. To use the visual system the person must turn it on (open your eyes) and direct it to the source of the stimuli.

The hearing person, of course, develops his language and communication skills through hearing and speech. The global nature of the hearing sensory system means that the infant is embedded in a sea of meaningful sounds that he can not turn off. Once language and speech patterns are established, they are transferred to the visual system through the development of literacy skills.

The creation of written symbols was a giant leap forward for society. It meant that accurate, stable, and permanent records of the knowledge and experience of civilization could be transferred over time and distance. Ideas developed in one part of the world could be shared with others who never came in direct contact with the original thinkers. Moreover, ideas and events that happened in one generation could be shared with following generations.

The primary language and communication skills of the average person are developed through speech and language and then transferred to the written form. As a beginning reader discovered, "Oh! Reading is just talk in a book." This shows great insight on the part of the young learner.

Since communication skills were built on oral and aural systems, certain safeguards have developed to assure clear communications. There is redundancy built into the signal so that when the speech signal is buried in noise the receiver can fill in the blank spots. This is partially done by grammar and by phonetic clues.

On the other hand, visual communications, whether they are in the form of speech reading, finger spelling, or sign language, have a number of ambiguities that act as noise in the signal. As noted earlier, the receiver must be looking at the sender and the light must be sufficient for vision to work. Obviously, communication skills do develop among the hearing impaired and there is no question that visual communication systems can be the primary system. Oral/aural, oral/visual, and manual/visual common communication systems are eventually associated with the more stable written format of language.

The printed word developed differently in different parts of the world. One system was based upon pictographs and ideographs and the other on phonetic representations of the sounds. Pictographic and ideographic systems are still used. The average Japanese, for example, must learn several thousand different symbols to become literate. On the other hand, the nations that use phonetic alphabets must learn the letter that represents the sounds of the language.

English spelling is a particular challenge to literacy since it is based upon a phonetic principle, but has many discrepancies. Consequently, the spelling of many English words must be learned by rote because in some instances words like "women" are not faithful phonetic representations. "GHOTI" for a new reader of English could logically be the spelling for FISH. They would associate the "gh" as the sound in enough, the "o" as the sound in women, and the "ti" as it is pronounced in nation. English spelling is simply not a faithful one-to-one phonetic language.

On the other hand, finger spelling is a one-to-one manual/ written communication system that faithfully represents the printed word. Among other reasons for this problem in English was the invention of the printing press which fixed spelling in printers fonts and left us a legacy of non-phonetic spellings. English has 44 phonemes which are represented by the 26 letters of our alphabet. But we do not consistently combine the letters to represent the sounds. Some sounds are represented by several different letter combinations. Simple examples are that both f and ph represent the "f" sound and that gh represents the "f" sound at the end of words. This causes problems in developing high levels of literacy in hearing people. The United States has one of the highest illiteracy rates of any developed nation in the world.

There have been many reformers who would have corrected our alphabet and given us a more precise system. Alexander Graham Bell developed an alphabet entitled visible speech. This was a three case system that provided information on where the lips, tongue, teeth, voice, breath, and nasal aspects of the phonemes were produced. This system was used extensively in transcribing languages that did not have a written form. George Bernard Shaw left his estate to the reform of English spelling to make it more phonetic, and Sir James Pitman has long sought a more scientifically based written system. Ironically, these reforms have been fought by the status quo of our society even though we pay a high price in illiteracy because of it. It just may be that the computer revolution will facilitate some of the needed reforms. Both synthesized speech and computer analyzed speech could be facilitated by a better alphabet and spelling system.

We have been able to translate print into speech and are working on speech into print. There are available on the market today print to speech machines and promising speech to print machines.

Barbara Tuckman was asked what were the most important technologies modern man had developed to increase literacy. Her reply, much to the dismay of computer and technology experts, was that in her opinion the greatest technologies to enhance universal literacy were (1) the electric light and (2) wearable eye glasses.

The electric light meant that reading could take place at any time during the 24 hour day and wearable glasses meant that people could read for their entire lives, regardless of the physical changes we all suffer with age. When you think about it this is a very profound answer. These technologies essentially expanded the available time on task for people to read. I have tried to set the stage for the use of print technologies in the education of hearing impaired youngsters by discussing the nature of literacy in general. In summary, the young hearing child develops through many associations within the environment a speech and language system that associates real experiences with speech symbols. Once that system is developed reading and writing are developed on top of the speech and listening system.

The hearing impaired child, even if he or she is making maximum use of residual hearing, must develop a language based upon visual symbols. In most education programs there is a synergy among the spoken, signed, finger spelled word or language concept and the referent in the real world. As a matter of fact, during the development stages the printed symbol is also associated with the event. There are a number of studies that indicate that the printed word is the most stable of the visual symbols used by hearing impaired children.

Technology provides us with a wide range of visual print symbols that can carry a richer meaning. For example, if we added color to closed captions we could assign a specific color for male voices and one for female voices. The captioning techniques of today place the captions near the speakers. Voice over narration is indicated by placing the caption at the top of the screen. Music is indicated by "note quotes" around the sung portion of the program, etc. Obviously, there are a number of additional refinements that can be made. In a play, if male and female voices are coded by color, individual characters could be assigned different type fonts. J.R. in "Dallas" is always blue and with a geneva type font etc.. Captioning may be one of the most important services offered hearing impaired people. It provides them with a massive amount of language usage associated with story and action experiences on television.

Language development remains a problem for hearing impaired infants and children. Traditionally we find that most hearing impaired children, regardless of the location of their school, remain three or more years behind their hearing peers in academic achievement. Much of this lag is dependent upon development of sophisticated language skills. Technology offers us the ability to provide new and different experiences that can associate language symbols with experience. For example, interactive videodiscs or DVI CD-ROM interactive programs can provide individual study stations that give the user a multiple linguistic experience. It is possible to develop a program that provides for language building experiences and allows the user to experience the program through auditory and speech symbols, finger spelled symbols, total communication systems, or American Sign Language at the flip of a switch. All can be associated with captions.

Text on screen is not limited to the traditional book text format. Words can pop on the screen, move, and indicate their meaning. For example, in "Sesame Street" and "The Electric Company" we had words that animated into their referents. FAT grew fat until it covered the entire screen, THIN became tall and thin. Other words such as angry, cry, happ, etc., animated into characters that identified the state of feeling; verbs actually took on their meaning. FLY began to flap and fly around, WALK began to walk etc..

In the mid 1970's, I was particularly interested in the ability of the computer to animate and change words into their referents. I took sentences, such as: **The butterfly flew around the flower** and as the words were said they changed into their meaningful referents, i.e., the word "butterfly" became a butterfly when it was said, "flew" (the word and the butterfly began to fly), "around" began to circle and "the flower" turned into a flower. The final scene was a butterfly flying around a flower and the caption changed to: **The butterfly is flying around the flower.**

In today's world of technology we might have this happen as the learner reads the sentence into the microphone or as the learner types it into the system. The beauty of today's technology is that it can be immediate and interactive.

Margaret Withrow and Charles Csuri of Ohio State University's Computer Graphic Center created a series of computer-generated programs that allowed learners to experience a number of language concepts. These programs cue captions to auditory signals and language concepts.

Another computer-generated series of programs were experimented with at the National Technical Institute which in one instance gave the learner control over a "Star Trek" program. To save the universe from the Klingons the user had to work mathematical problems for the Captain. Another was a job interview. The last one used Withrow and Csuri created computer animated characters. The learner could either describe what was happening or command the animals to do certain things within the limits of the computer's animated world. Most learners loved to command the animals. There was a certain degree of argumentative dialogue that went along with the program. For example, when the learner logged onto the program, a series of weather questions were asked and if the temperature was 20 below zero, snowing, and windy then the animals respond accordingly. If, for example, you ask the frog to swim, the computer asks you if there is an indoor pool, etc.. There is an Empire State building in the computer's animated environment. You can, of course, ask the frog to jump over the building...the frog will argue and finally attempt to jump, but of course hits the walls and ends the game. If you asked the frog to fly the computer might ask you how many wings the frog had or if you are willing to buy the frog an airline ticket. The learner entered the program through the keyboard. Today, or in the near future it would not be impossible to enter such programs through voice analysis.

Interactive video programs could create a dictionary that enabled the person to receive a moving example of the word, a spoken example of the word, a finger spelled example and a signed example of a word on demand of the learner. Such an interactive dictionary would be meaningful not only to hearing impaired students, but other learners who have not mastered literacy fully.

Much of the work in applying technology to educate hearing impaired youngsters has been directed towards providing more linguistic experiences for them. In the 1960s, Robert Step at the University of Nebraska developed interactive 8mm films shot from the viewpoint of the young child and provided a number of manipulative activities for the young child and provided a number of manipulative activities for young deaf children to speech read. Withrow's Lip reading films were done in conjunction with the University of Nebraska and the Illinois State School for the Deaf. These were single concept films developed to provide experiences and increase vocabulary. PROJECT LIFE was developed to again provide language experiences through technology.

John Gough, Gilbert Delgado, and Malcolm J. Nowrood, through their leadership in captioning techniques, explored many avenues for creating more new linguistic experiences for the hearing impaired population. George Propp and Robert Step were pioneers at the University programs and were on the cutting edge of design for interactive videodiscs.

The key to captioned television for the hearing impaired and the development of computer programs for literacy for the hearing impaired is that they increase significantly the amount of linguistic interaction available to a young hearing impaired child.

If we look at the history of education of the hearing impaired children, we can see that many of our forbearers explored a wide range of technological and scientific applications to education of the hearing impaired. Obviously, Alexander Graham Bell contributed much in this area through the telephone; however, his understanding of speech, literacy, and print may have been a greater contribution. Many of the pioneers of education of the deaf, such as Edith Fitzgerald and her peers, developed technologies of form and structure that assisted in the development of language for the deaf.

The Regional Media Centers for the Deaf and their drive to teach teachers of the hearing impaired to use among other things, the overhead projector as a blackboard increased the teacher-pupil interface time. A teacher of the deaf who turns to the blackboard to write loses contact with the pupil. A teacher using an overhead projector maintains contact.

This year will mark forty years that I have been interested in the use of technology to reinforce education of hearing impaired youngsters. In that period of time, we have seen great advances in technologies. Today, we can develop a wide range of universally available learning tools that will increase the quality of education for all hearing impaired people. Today, we have a mature captioned television program with more than 200 hours of available programs that we can view each week. We have the opportunity to expand that service by looking at more efficient formats of captioning. There are a number of excellent captioned educational materials available for the classroom teacher to use.

I would like to see greater development of computer and interactive laser technologies used in education of the hearing impaired.

I would like to see a more rapid conversion of TDD systems to ASCII codes so that the hearing impaired will have more universal access to electronic systems. I would like the development of more sophisticated uses of language in interactive programs. There is a continuing need for upgrading teachers' skills in using new technologies. I would like to see programs take advantage of distance learning technologies to reach the professional community.

There is much to do and it should be challenging. If we solve some of the literacy problems among the hearing impaired, we may also be working to solve literacy problems in the total community. We can ill afford to remain a nation that does not work to make the best of all of our human talent. We cannot allow significant numbers of our citizens to remain illiterate.

The door to achievement for hearing impaired people is the development of good literacy skills. That is the ability to read with meaning and to write with a critical eye to the knowledge they have.

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